4.0. LABORATORY SERVICES

This section describes laboratory services available through Environmental Chemistry Lab (ECL). The Department laboratories include the Environmental Chemistry Lab (ECL), and ECL-Southern California (ECL-SC). ECL is the primary lab serving northern and central California, and ECL-SC is the primary lab serving southern California.

Services of a commercial laboratory are also available as described on the contract laboratory section.

The following four pages list individuals to contact for more information in each of the categories listed.

Environmental Chemistry Laboratory
California Department of Toxic Substances Control

Bruce La Belle, Ph.D., Chief
Thomas Li, Ph.D., Asst. Chief

Main Office:

700 Heinz Ave; Suite 100
Berkeley, CA 94710
Phone: (510) 540-3003

Telecopier: (510) 540-2305

Sample Receiving:

700 Heinz St., Suite 150
Berkeley, CA 94710
(510) 540-3610

(510) 540-3615

Environmental Chemistry Laboratory - Southern California (ECL-SC):

1449 W. Temple Street, Room 101
Los Angeles, CA 90026

Contact: Russ Chin
Phone: (213) 923-4879

Telecopier: (213) 580-5706

Information Contacts (alphabetical order)

Bioassay and Fish Bioassay:

Lorna Garcia	2441	
James Cheng	2337	

Biomonitoring:

Kim Hooper	3499	Cell: (510) 812-6546

Contract Laboratories:

Lorna Garcia	2441

Sample Transport Contacts:

Ramona Pam	3580

Data Interpretation, Data Validation, SAP and QAPP Review:

Lorna Garcia	2441
James Cheng	2337

Laboratory Information Management System (LIMS):

Jiong Cao	2925
Cuiyan Gan	3284

GC and LC Analyses:

Jarnail Garcha	3468	Cell: (510) 812-6554
Russ Chin (ECL-SC)	(213) 923-4879	

GC/MS Analyses:

William Lum	3060	Cell: (510) 812-6552
Russ Chin (ECL-SC)	(213) 923-4879	

Health and Safety:

Gurmail Sivia	3622
Martin Snider	5258, 2773

ICP and ICP/MS:

Jarnail Garcha	3468	Cell: (510) 812-6554

Immunoassays

Ruth Chang	3447	Cell: (510) 812-6558
Cindy Dingman	2329	

Inorganic Analyses - Metals, Waste Extraction Test, and Anions:

Jarnail Garcha	3468	Cell: (510) 812-6554

Lab Waste Management:

Gurmail Sivia	3622	
Thomas Li	2047	Cell: (510) 812-6260

Methods Development:

Jarnail Garcha	3468	Cell: (510) 812-6554
William Lum	3060	Cell: (510) 812-6552
Russ Chin	(213) 923-4879	

Mobile Laboratory:

Ruth Chang	2651	Cell: (510) 812-6558

Operations Management and Lead Programs' Liaison :

Martin Snider	5258

PCDDs and PCDFs Analyses:

Reber Brown	3322
Joginder Dhaliwal	(510) 849-5256

Quality Assurance / Quality Control:

Cindy Dingman	2329

Sample Management Officer(SMO):

Gurmail Sivia	3622
Martin Snider	5258

Sampling and Monitoring:

Myrto Petreas	3624

Special Studies:

Martin Snider	(510) 849-5258	
Myrto Petreas	3624	
Kim Hooper	3499	Cell: (510) 812-6546

Support Services and Secretarial Staff:

Linda Johnson	3003
Virginia Washington	3003

ECL User's Manual:

Cindy Dingman 2329

RELATED LABORATORY SERVICES

DHS Environmental Laboratory Accreditation Program (ELAP):

850 Marina Bay Parkway, Bldg P, 1st Floor
Richmond, CA 94804
Phone: (510) 620-3155
Fax: (510) 620-3165
George Kulasingam, Ph.D., Program Chief

Environmental Health Laboratory Branch:

California Department of Health Services
850 Marina Bay Parkway, Suite 6365 / EHL
Richmond, CA 94804
Phone: (510) 620-2800
Fax: (510) 620-2825

Primary Contacts for Air Sampling and Analysis:

Stephen Wall 3123
Diamon Pon 2639

Contract Laboratory:

Theresa Allen
Sequoia Analytical Laboratory
885 Jarvis Drive
Morgan Hill, CA 95037 (408) 776-9600

Diane Galvin
Advanced Technology Laboratory
3275 Walnut Ave.
Signal Hill, CA 90807 (562) 989-4045

4.1 ENVIRONMENTAL CHEMISTRY LABORATORY ANALYTICAL SERVICES.

4.1.1 Introduction.

ECL is a full service analytical chemistry laboratory determining metals, anions, pH, flash point, volatile and semivolatile organic compounds (EPA base/neutral, acid extractable organics) including petroleum products, pesticides, carbamates, solvents, and explosives. ECL also has expertise in the non-routine, highly specialized analysis of unknown hazardous waste, and in providing technical review and technical consultation to DTSC. New analytical methods are developed or implemented by ECL to anticipate site and waste characterization needs and to address new regulations and laws for hazardous waste management. Past examples include the development and implementation of analytical methods for percholorate, total organic halogens in oil, halogenated aromatic sulfonic acids by high pressure liquid chromatography, gasoline range organics and diesel range organics in contaminated soil, metals by ICP/MS, and work on EPA's TCLP extraction technique. ECL also evaluates new processes, working with the Pollution Prevention Program, for the treatment and recycling of hazardous waste. In addition, ECL provides basic and advanced training courses encompassing sampling plans and techniques, analytical procedures, and data interpretation.

4.1.2 Analytical Requests.

One of the major questions facing DTSC staff in their site investigations is to determine which analyses are required to properly characterize the samples they have collected. Frequently, the "shotgun" approach is used and comprehensive analysis is requested. These may include volatile organics analysis (VOA), acid, base/neutral extractables, chlorinated and organophosphorus pesticides, carbamates, herbicides, polynuclear aromatic hydrocarbons (PAH), nitrophenols, trace metals and anions. Although the analyses mentioned above are routine, they do involve nine different analytical procedures, seven different sample preparations, and seven different instruments. Total analytical time, hence turnaround time, will be lengthy, making it difficult to assign a high priority level to the request.

A more efficient approach would be to request analysis for a specific class or classes of compounds based on site history, field observation and/or field screening results. Information about the site may be obtained from the types of wastes stored or disposed at the site. From the industrial or manufacturing processes, information can usually be derived about the composition of the wastes generated. Hazardous waste manifests, business records, and container labels also provide important information about waste composition. Another valuable reference is the Kirk-Othmer "Encyclopedia of Chemical Technology".

Field observations and field screening methods are particularly useful in determining which laboratory analysis to request. Field screening and hazardous characterization should be performed, as much as possible, on site when gathering information about the samples. Organic versus inorganic classifications may be determined using field testing procedures. When screening of volatile organics, field screening instruments, *e.g.* OVA, HNU, Miran, etc., should be used, if possible. Analytical requests should be made based on the information obtained. As an example, an analysis request for solvents and/or semivolatile organics is advisable if a sample matrix is found to be organic by initial screening tests. Metal analysis should not be requested on this sample unless organometallic compounds are suspected to be present.

Requestors can also rely on the expertise of ECL's analytical unit supervisors, both in Berkeley and Los Angeles to determine the type and level of analysis required. Consultation with ECL or ECL-SC is highly recommended before sampling.

Since July 1, 1990, the annual allocations of analytical lab services budgeted for DTSC have been based on the concept of the Laboratory Cost Unit (LCU). There are two types of LCUs charged to any procedure requested: the Basic Charge and the Analytical Charge. The first charge reflects instrumental and other preparatory work, and the second charge is reflective of the analyst's time and relative complexity of the procedure. Figures 4.0-1 and 4.0-2 list the most frequently requested analytical procedures and the corresponding Basic and Analytical charges in LCUs for each batch of ten samples or a fraction thereof. The total number of LCUs charged for a given procedure also includes necessary QC work.

Analytical requests should be made in accordance with the protocol specified in the "ECL Express Plan" (EEP) which is detailed in Appendix A. The purpose of the protocol is to match the analytical request (workload) with a lab (State lab or a contract lab), that has the capacity to perform the analysis within the required time frame. In the event that the lab capacity is not available, options will be thoroughly discussed with the requestor. An authorization for sample analysis must be obtained by the requestor before laboratory analysis begins.

To obtain an authorization for sample analysis, the requestor must submit, by FAX at (510) 849-5271 or e-mail, an Authorization Request Form (ARF) to ECL's Sample Management Officer (SMO), e-mail to GW's "Sample Mgmnt" mail station. Within two working days of receiving the ARF, the SMO will locate a laboratory available to perform the analysis and issue an Authorization Number (AN) for the request. It is essential that the requestor indicate the objective(s) of the analysis and specify what quantitation limits are needed on the ARF, Part A (Attachment 2, Appendix A) and on the SAR, line 14 (Fig.4.0-2). The information provided will help the laboratory to determine which sample preparation and analytical method to use. Requesting an analysis procedure that is additional to the original authorization will require a re-authorization by the SMO before the laboratory proceeds with the analysis. The ARF and SAR forms are available

on LAN's "T" drive under T:Forms/ECL/ARForSAR form.

Quantitation Limits for routine analytical procedures are provided in Appendix B. These are only approximations and are highly dependent on the nature of the matrix. If a lower quantitation limit is needed be sure to call ECL (the contacts and phone numbers are listed in Section 4.0-Laboratory Services. The Sample Analysis Request (SAR) form (Rev. 6/00, which must accompany all samples submitted to the laboratory, is used to provide some information on the samples collected, specifies the analysis required, and documents the chain of custody (see Figure 4.0-2). Instructions, code designations, SMO and lab telephone numbers and container information are printed on the reverse side of the SAR form. To prevent potential delays on laboratory sample analysis, it is also essential that the requestor enter all applicable codes and information, including analysis objectives and special detection limit requirements on the SAR.

For information on sampling, sample containers, sample preservation, documentation and sample shipment, refer to Section 3. Samples should be collected and shipped directly to the designated laboratory no later than five working days past the expected delivery date indicated on the ARF. Please note that samples with short holding times (consult with Tables 3.7-2 and 3.7-3) should be delivered **as soon as possible** after collection to the designated laboratory, or the laboratory may not be able to meet the sample holding time requirements.

Samples are routinely saved by the laboratory until permission is received from the requestor authorizing the proper disposal of the samples. A Sample Disposal Form is sent to the requestor by the laboratory soon after the final analysis is completed. The requestor should complete the form and return it to the laboratory. Sample Storage capacities (State and commercial laboratories) are limited, **so requestors are advised to promptly inform the laboratory of the sample disposition**. Samples that may be used as evidence in legal proceedings should be saved until the suit is settled.

Table 4.1-21 at the end of this section contains the EPA, ECL, ECL-SC, and contract laboratory equivalent method numbers for organic, inorganic, and miscellaneous analytical methods. Table 4.1-22 contains the EPA equivalent analytical method numbers for solid waste, wastewater, and drinking water. The status of ECL In-House Methods is listed in Table 4.1-23. The status of ECL SOPs is listed in Table 4.1-24.

Figure 4.0-1

ENVIRONMENTAL CHEMISTRY LABORATORY
ANALYTICAL PROCEDURES AND CORRESPONDING
LAB COST UNITS (L C Us)

PROCEDURE	CODE	CHARGES	
		BASIC L C Us	ANALYTICAL LCU / SPL
Anions Scan(F,Br,Cl,NO3,NO2,SO4,PO4)	C	7	2
Carbamates	E	29	6
Cations Scan	F	7	2
Chlorophenols (TCP, PCP)	G	18	6
Cyanides	H	10	4
Diesel, GC/FID	I	16	7
Dinitrocompounds, HPLC	J	21	7
Dioxins and Furans	K	35	15
EDB and DBCP	L	15	5
Extractable Organics (BNA)	N	40	7
Gasoline, GC/PID/FID	P	16	7
Herbicides (Chlorinated)	Q	30	15
Ignitability	R	3	2
Metals Scan	S	12	2
Metals, Specific (1-2 Metals)	T	10	2
Moisture, %	U	2	1
Non-Target Organics, LC/MS	V	Variable	Variable
Oil and Grease	W	7	4
Organolead (FAAS)	X	10	2
Organochlorinated Pesticides	Y	24	10
Organophosphorus Pesticides	Z	24	10

prolcuwk.3nly.10/95

Figure 4.0-1 con't

ENVIRONMENTAL CHEMISTRY LABORATORY
ANALYTICAL PROCEDURES AND CORRESPONDING
LAB COST UNITS (L C Us)

PROCEDURE	CODE	CHARGES	
		BASIC L C Us	ANALYTICAL LCU / SPL
P A Hs	ZA	36	11
P C Bs	ZB	21	8
pH	ZC	2	1
Semivolatile Organics, GC/MS	ZE	45	12
Specific Conductance	ZF	2	1
TCLP	ZG	Variable	Variable
Total Petroleum Hydrocarbon (TPH)	ZH	8	3
Total Organic Halides (TOX)	ZI	7	5
Volatile Organics, GC/MS (Cap.Column)	ZK	15	5
Waste Extraction Test (W.E.T),California	ZO	12	3
Misc. Procedures such as: Particle Sizing, reactivity, Ethylene Glycol Confirmation of Non-target Compounds, etc.	ZZ	Variable	Variable

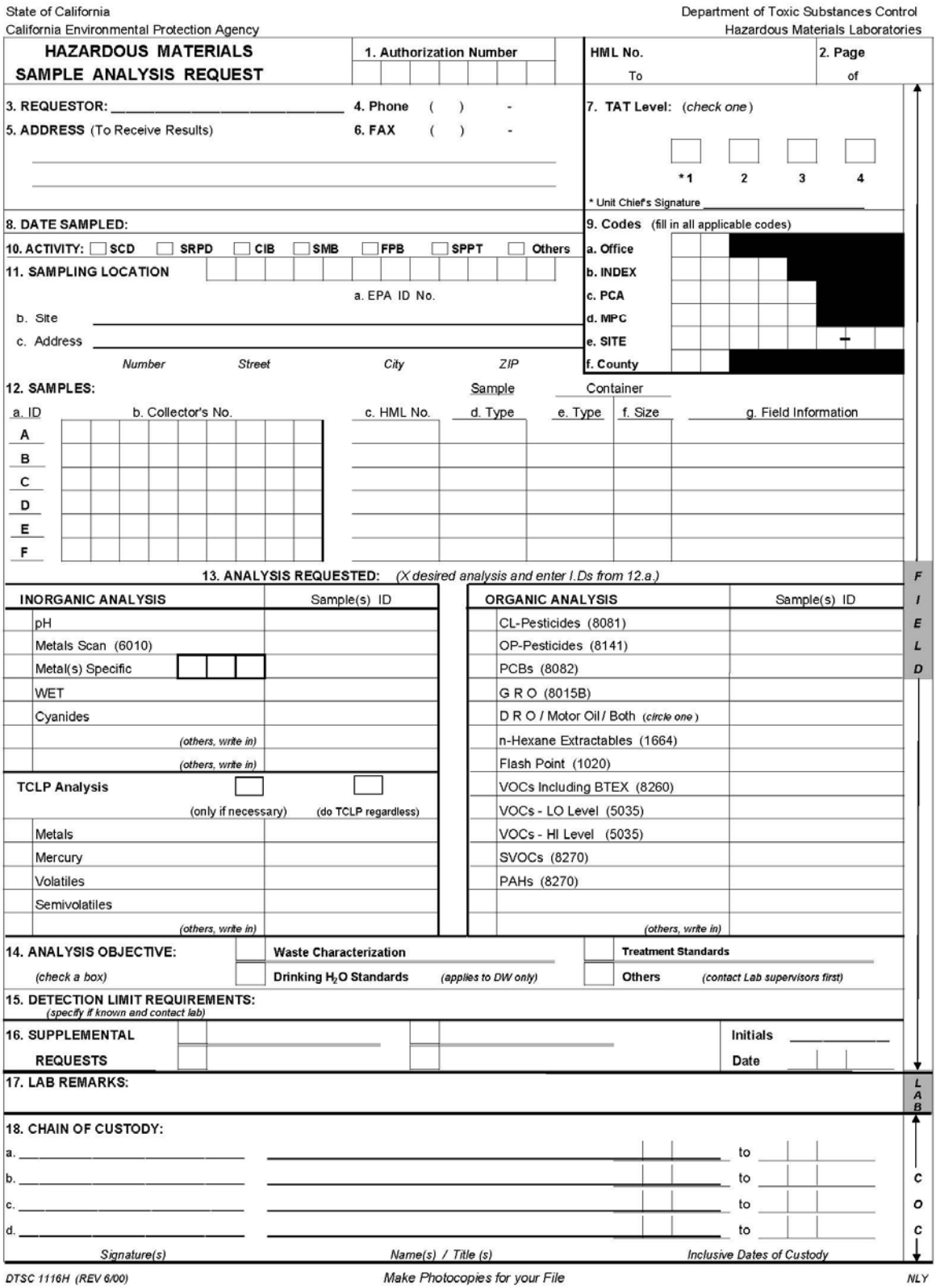
prolcuwk3.nly.10/95

BASIC CHARGE:
Reflects the expenditure of lab resources for instrument set-up, calibration and QC work for each batch of 10 samples (4 for Dioxins).

ANALYTICAL CHARGE:
Based on actual measurement of expenditure of lab resources for performing the sample analysis.

TOTAL CHARGE FOR A BATCH OF SAMPLES, LCUs =

Basic Charge **x** n/10 or 4 **+** Analytical Charge **x** n
Where n = number of samples



State of California
California Environmental Protection Agency

Department of Toxic Substances Control
Hazardous Materials Laboratories

HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

1. Authorization Number

HML No. / To

2. Page / of

3. REQUESTOR: _____ 4. Phone ( ) -

5. ADDRESS (To Receive Results) 6. FAX ( ) -

7. TAT Level: (check one)

*1 2 3 4

* Unit Chief's Signature _____

8. DATE SAMPLED:

9. Codes (fill in all applicable codes)

10. ACTIVITY: SCD SRPD CIB SMB FPB SPPT Others

11. SAMPLING LOCATION

a. EPA ID No.

b. Site

c. Address

Number Street City ZIP

a. Office
b. INDEX
c. PCA
d. MPC
e. SITE
f. County

12. SAMPLES:

a. ID	b. Collector's No.	c. HML No.	Sample d. Type	Container e. Type	f. Size	g. Field Information
A						
B						
C						
D						
E						
F						

13. ANALYSIS REQUESTED: (X desired analysis and enter I.Ds from 12.a.)

FIELD

INORGANIC ANALYSIS	Sample(s) ID
pH	
Metals Scan (6010)	
Metal(s) Specific	
WET	
Cyanides	
(others, write in)	
(others, write in)	

TCLP Analysis (only if necessary) (do TCLP regardless)

Metals	
Mercury	
Volatiles	
Semivolatiles	
(others, write in)	

ORGANIC ANALYSIS	Sample(s) ID
CL-Pesticides (8081)	
OP-Pesticides (8141)	
PCBs (8082)	
G R O (8015B)	
D R O / Motor Oil / Both (circle one)	
n-Hexane Extractables (1664)	
Flash Point (1020)	
VOCs Including BTEX (8260)	
VOCs - LO Level (5035)	
VOCs - HI Level (5035)	
SVOCs (8270)	
PAHs (8270)	
(others, write in)	

14. ANALYSIS OBJECTIVE: (check a box)
Waste Characterization; Drinking H_2O Standards (applies to DW only); Treatment Standards; Others (contact Lab supervisors first)

15. DETECTION LIMIT REQUIREMENTS: (specify if known and contact lab)

16. SUPPLEMENTAL REQUESTS

Initials _____ Date

17. LAB REMARKS:

LAB

18. CHAIN OF CUSTODY:

	Signature(s)	Name(s) / Title (s)	Inclusive Dates of Custody
a.			to
b.			to
c.			to
d.			to

COC

DTSC 1116H (REV 6/00) Make Photocopies for your File NLY

Figure 4.0-2 Con't

INSTRUCTIONS

1. **Authorization No.** - Enter the number acquired from HML's STO.
2. **Page —of—** - Enter number of this page and the total number of pages to complete this request.
3. **Requestor's Name** - Print.
4. **Phone** - Enter Area Code and Phone Number of the Requestor.
5. **Address** - Where results should be sent.
6. **FAX** - Number to FAX results to.
7. **TAT Level** - check one : Turnaround Time Level.
   Level 1: 15 days and requires the signature of Unit Chief on SAR.
   Level 2: 30 days, Level 3: 45 days and Level 4: when possible.
8. **Date Sampled** - Enter date of sample(s) collection.
9. **Codes** - All applicable codes must be entered
   a. See Table II below.
   b-e . See DTSC lists of these codes.
   f. Enter County Code from Table I below.
10. **Activity** - Check the appropriate box to indicate DTSC activity generating sample(s). Check "Others" for unlisted and Non-DTSC samples.
11. **Sampling Location** - Where sample(s) are collected
    a. EPA ID No. - Enter U.S.EPA twelve-digit identification no. for the site
    b. Site - Enter nameof generator, facility or site.
    c. Address - Enter address of generator, facility or site designated in 11 b. Enter two-digit County Code in item 9 f.
12. **Samples** - Enter specific information as indicated.
    a. ID - Predesignated Line Identifier.
    b. Collector's No. - Enter the collector's sample number(s). Number should NOT exceed 9 characters.
    c. Lab No. - For Lab use only.
    d. Type - Enter sample type, e.g., sludge, soil, etc.
    e. Container Type - Enter appropriate container codes from Table III
    f. Container Size - Enter appropriate container size from Table III. Full size is required for analysis.
    g. Field Information - Enter information significant to personnel safety and analysis requested, e.g., cyanide contamination suspected, air volume if applicable, etc.
13. **Analysis Requested** - Check one or more of the boxes as applicable. For each box checked, enter the line identification code(s) (item 12 a.) to designate the sample(s) to be analyzed, e.g.,
    ☐ pH A,C,H.
14. **Analysis Objective** - Check one.
15. **DL Requirements** - Specify, and contact Lab if unusual.
16. **Supplemental Requests** - Enter procedures additionally requested, line or sample ID, initial and Date for Supplemental Requests ONLY.
17. **Lab Remarks** - For Lab use only.
18. **Chain of Custody (COC)** - Chronologically, the person(s) who had custody of the sample(s) should enter information above the lines as designated. Item 18 c. is for the latest in the chain of custody.

Table I - CALIFORNIA COUNTY CODE NUMBERS (Item 9f)

Code	County	Code	County	Code	County
01	Alameda	20	Madera	39	san Joaquin
02	Alpine	21	Marin	40	San Luis Obispo
03	Amador	22	Mariposa	41	San Mateo
04	Butte	23	Mendocino	42	Santa Barbara
05	Calaveras	24	Merced	43	Santa Cruz
06	Colusa	25	Modoc	45	Shasta
07	Contra Costa	26	Mono	46	Sierra
08	Del Norte	27	Monterey	47	Siskiyou
09	El Dorado	28	Napa	48	Solano
10	Fresno	29	Nevada	49	Sonoma
11	Glenn	30	Orange	50	Stanislaus
12	Humboldt	31	Placer	51	Sutter
13	Imperial	32	Plumas	52	Tehama
14	Inyo	33	Riverside	53	Trinity
15	Kern	34	Sacramento	54	Tulare
16	Kings	35	San Benito	56	Ventura
17	Lake	36	San Bernardino	57	Yolo
18	Lassen	37	San Diego	58	Yuba
19	Los Angeles	38	San Francisco		

Table II
DTSC Offices
(Item 9 a)

Sacramento	01
Fresno	1F
Berkeley	02
Glendale	03
Cypress	04
HQ Units	05

HML
Phone & FAX Numbers

HML Berk (510) 540-3003

HML L.A. (213)580-5796

HML STO (510)540-3111
FAX (510)849-5271

Table III - Container Type and Size (Items 12 e and 12 f)

	Liquid Samples		Solid Samples	
	Type	Size	Type	Size
Organic Analysis, Gen	G	1000 ml	G	250 mg
Organic Analysis, VOA	G-V	40 ml	G-V	40 gm
Organic Analysis, Tox	Ambr G-V	100 ml	Ambr G-V	40 gm
Inorganic Analysis	P, G	1000 ml	G	250 gm

P=Polyethyene Container & Closure G=Glass Container with Teflon Closure G-V=Glass VOA vial or bottle with Teflon Septum

,DTSC 1116H (REV 6/00) *Instructions*

Figure 4.0-2 Con't

4.1.3 **ECL Capabilities.**

ECL can routinely analyze samples for the 17 elements and the volatile and semivolatile organics listed in Tables I, II and III of Title 22, California Code of Regulations (5/31/91), 66261.24(a)(1)(B), (2)(A) and (2)(B). ECL also excels in performing non-routine analysis, such as in characterizing and identifying unknown wastes. An example of past work was the analyses of unknown waste samples taken from drums Stored at Pier 70, San Francisco. Screening tests were initially employed to separate the samples into organic or inorganic classifications. Further analyses identified polyamines, organic acids, sodium sulfite and polychlorinated biphenyls (PCBs) in some of the samples. These results were used in the successful criminal conviction of the responsible party.

The following categories of analysis are routinely performed in ECL. Classification and identification of non-routine hazardous materials are also performed in this laboratory by special requests.

4.1.3.1 Physical Testing.

1) Acidity/Alkalinity: This test is used to measure the amount of strong acid or base in a sample. Results are reported in units of milliequivalents/gram or millequivalents/liter.

2) Asbestos: By special arrangement, asbestos in a sample can be analyzed by Contract Laboratories. Samples should be submitted to the Contract Laboratory.

3) % Dry Solids: ECL Method 704-S may be used to determine the weight percent of dry solids in a soil, sediment or solid waste sample. Beginning October 1993, all soil samples received by the laboratory have been routinely analyzed for % dry solids. The result obtained in this procedure may be used to convert the wet-weight concentration[1] of an analyte (concentration obtained from the wet sample) to a dry-weight concentration as described in the following equation.

$$\text{Dry weight conc.} = \frac{\text{Wet weight conc.}}{\text{\% dry solids}} \times 100$$

[1] Note: Analyte concentration results are reported on a wet-weight basis unless requested otherwise.

4) Ignitability: EPA Method 1020 is used to characterize the flammability of liquids. This test is applicable to liquids only. Flash points less that ambient temperature are reported as, e.g., "<70^{o}F." Flash points greater than 140^{o}F (the hazardous waste criterion) are reported as ">140^{o}F."

   ECL Method 720 is also available to characterize the flammability of compressed gasses in aerosol products. The method is based on ASTM Standards D 3074-72 and D 3065-72.

5) Melting Point: This test is useful as a supplemental tool in the identification of pure solids.

6) pH: This test is used to determine if the sample is corrosive. For soil samples, our method involves measuring the pH of the aqueous solution or of a 1:1 mixture of soil and water, as specified in the Title 22 hazardous waste criteria.

7) Radioactivity: By special arrangement, radioactivity in a sample can be determined by the Sanitation and Radiation Laboratory (SRL) in Berkeley.

8) Reactivity: The test performed is dependent on the reactivity characteristic(s) of the sample. Tests may be performed to determine if a sample is dangerously reactive with water or generates toxic fumes when mixed with water. Tests for reactive cyanides and sulfides may also be performed.

9) Specific Conductance: This method is used to measure the specific conductance of drinking, ground, surface, and saline waters, domestic and industrial aqueous wastes and extracts or saturated paste extracts of soils.

4.1.3.2 Organic Analysis.

Prior to collecting samples for organic analysis, the collector must review all pertinent information such as field data, history of the sampling site, previous analytical data, and regulation requirements in order to determine the types or classes of organic compounds that are of interest and are likely to be present. Whenever possible, individual organic compounds, or a specific class of organic compounds, should be requested rather than the general characterization of a sample. The collector should also submit any relevant field/sample related information, as well as the objective of the sampling to the laboratory. This information is valuable to the laboratory staff in selecting the proper analytical method and instrument configuration that is optimized for the target analytes.

Analytical instruments available for organic analysis in ECL include gas chromatographs with a variety of detectors including mass spectrometers, liquid chromatographs, and an infrared spectrophotometer.

Organic methods in ECL are classified into two basic categories: volatile analysis and

semivolatile analysis.

1) VOLATILE ORGANIC ANALYSIS

Gasoline Range Organics (GROs):

Gasoline range, or purgeable organics in environmental samples are analyzed by purge-and-trap GC/FID technique (EPA 8015B).

GC-MS Scan for Volatiles:

This method is appropriate for the characterization and identification of unknown volatile organic compounds in hazardous waste samples. It is useful when prior history or information on chemical contamination of the sampling site is unavailable or unknown.

Although GC-MS scan uses the same analysis conditions as Method 8260, the method is qualitative. A tentative identification is assigned only if the electron impact mass spectrum of the unknown matches a spectrum from the mass spectral database of 43,000 organic compounds.

If no match occurs, the fragmentation pattern of the unknown is examined to determine if characterization is possible by identifying specific classes of organic compounds (*e.g.*, hydrocarbons, aliphatic, aromatic, etc.)

By special request and with ECL approval, non-target analytes can be confirmed and quantitated if the reference standards are available.

EPA Method 8260B - Volatile Organics by GC-MS (Table 4.1-1):

This is a GC-MS purge-and-trap quantitative method for volatile organics. The volatile components of a sample are purged with helium and concentrated in a sorbent trap. The trap is then rapidly heated to introduce the volatiles into the GC-MS system. The volatile mixture is separated in a capillary GC column and electron impact mass spectroscopy is used to identify the volatile compounds.

This method is used to quantitate volatile organic compounds (VOCs)that are insoluble or slightly soluble in water. Sample preparation procedures are dependent on the matrix types. An aqueous sample is purged directly, a soil sample is extracted with methanol and an aliquot of the methanol extract is purged. An organic liquid sample or a sample highly contaminated with organics must be highly diluted before analysis. Quantitation limits are therefore dependent on the sample matrix type and organic content.

It is important to note that GC/specific-detectors (*e.g.*, photoionization or electrolytic conductivity) usually provide lower detection limits than GC-MS.

These methods generally use GC-MS confirmation except at very low levels below GC-MS detection.

ECL Method 850 - Volatile Organics by Headspace GC-MS:

A septum vial containing the sample is heated to release the volatile organic components. An aliquot of the vial's headspace is injected into a GC-MS system. The GC column separates the volatiles into individual organic compounds. As each organic compound elutes from the column, it is subjected to electron impact ionization to produce a characteristic mass spectrum. The resulting mass spectrum is used to search against a mass spectral library for organic compound identification.

The method is useful for identification and characterization of volatile organics. Unknown volatiles in less contaminated samples can be individually identified and qualitatively confirmed, if reference standard materials are available. For highly contaminated samples where complete chromatographic separation is not possible, this method can yield important information as to which class or classes of volatile organics are present (i.e., chlorinated solvents, oxygenated solvents, aliphatic hydrocarbons or aromatic hydrocarbons). The proper analytical method can then be selected for optimal detection and quantitation.

3) **SEMIVOLATILE ORGANICS**

Diesel or diesel range organics (DROs) and motor oil or motor oil range organics (MOROs):

Diesel and motor oil range organic are analyzed by extraction of semivolatile hydrocarbons with methylene chloride and determination by GC/FID (ECL SOP 816-S). Tentative diesel and motor oil identification is based on chromatographic pattern recognition. Quantitation is done by comparing total peak area of the sample chromatogram with an external diesel or motor oil standard. This is a **compound non-specific, semi-quantitative analysis**.

EPA Method 1664: N-Hexane Extractable Material (HEM) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM) by Extraction and Gravimetry(Oil and Grease and Total Petroleum Hydrocarbons)

Concentrations of specific compounds or substances are not measured. Rather, groups of substances with similar characteristics are determined gravimetrically, based on their common solubility in *n*-hexane. In order to be measured, the substance must:

1. be soluble in *n*-hexane.
2. be extractable from an acidified sample.
3. not be volatilized (lost) during the sample work up. Applicability is limited

to semivolatile compounds.

GC-MS Scan for Semivolatiles:

This method is appropriate for the characterization and identification of unknown semivolatile organic compounds in hazardous waste samples. It is useful when prior history or information on chemical contamination of the sampling site is unavailable or unknown.

Although GC-MS scan uses the same analysis conditions as Method 8270, the method is qualitative. A tentative identification is assigned only if the electron impact mass spectrum of the unknown matches a spectrum from the mass spectral database of 43,000 organic compounds.

If no match occurs, the fragmentation pattern of the unknown is examined to determine if characterization is possible by identifying specific classes of organic compounds (*e.g.*, hydrocarbons, aliphatic, aromatic, etc.)

By special request and with ECL approval, non-target analytes can be confirmed and quantitated if the reference standards are available.

EPA Method 8270C - Semivolatile Organics by GC-MS (Table 4.1-2):

This method is used for the determination of semivolatile organics by GC-MS. The method involves sample extraction with methylene chloride, followed by GC-MS analysis for specific (target) compounds and for major non-target compounds (tentative identification). There are about 250 compounds listed in this method. ECL routinely analyzes samples for 67 compounds commonly found in hazardous waste streams. Others on the SW-846 list are by special request.

EPA Method 8082-Polychlorinated Biphenyls (PCBs) (Table 4.1-3):

Aroclor is the trade name for the PCBs manufactured by Monsanto. The first two digits of the four digits represent the types of molecules (12=chlorinated biphenyls); the last two digits represent the weight percent of chlorine (Aroclor 1221 = 20.5 to 21.5% of Cl, Aroclor 1260 = 60% of Cl). The only exception is Aroclor 1016 which does not follow the above description but rather contains 41% Cl by weight. The Aroclors listed in Table 4.1-4 are analyzed by GC/ECD. Confirmation for PCB is generally accomplished through pattern recognization of the eluting peaks. However, when matrix effects interfere with pattern recognition, confirmation using a second column or GC-MS may be necessary.

EPA Method 8081A-Chlorinated Pesticides and Toxaphene (Table 4.1-4):

Toxaphene and 20 chlorinated pesticides are routinely analyzed by capillary GC/ECD. Quantitation and confirmation are performed by a simultaneous two column analysis. (Toxaphene and congener-specific PCB analysis is available upon request. For information see special Analysis Requests section 4.1.3.4)

EPA Method 8141A - Organophosphorus Pesticides (Table 4.1-5):

Twenty-three organophosphorus pesticides are routinely analyzed by capillary GC using a flame photometric detector (FPD) operating in the phosphorus mode. Confirmation is done with a second column and a nitrogen/phosphorus specific detector (NPD).

EPA Method 8151A - Chlorinated Herbicides (Table 4.1-6):
Ten chlorinated herbicides are analyzed in this method. This very lengthy procedure involves extraction, hydrolysis and derivatization with diazomethane, followed by GC/ECD analysis. Confirmation is accomplished by a second column analysis or GC-MS if needed.

EPA Method 8011 - Ethylene Dibromide (EDB) and Dibromo-chloropropane (DBCP):

EDB (CAS # 106-93-4) and DBCP (CAS # 96-12-8) are extracted from soils and aqueous samples by hexane extraction. Analysis is by GC/ECD. Confirmation is performed by a second column analysis or by GC-MS.

EPA Method 8310 - Polynuclear Aromatic Hydrocarbons (PAH or PNA)(Table 4.1-7):

Sixteen PAHs are analyzed by HPLC using the UV and fluorescence detectors. Confirmation, if necessary, is performed by GC-MS. This analysis should only be requested if detection limits below those of Method 8270 are required. If PAH data are needed at low ppb quantitation limits (as in risk assessment), the requestor should note this requirement on the analysis request form so that the low level preparation procedure will be employed by the lab. These very low quantitation limits cannot be confirmed by GC-MS and will be confirmed by a second column technique.

EPA Method 8330-Nitroaromatics and Nitramines (Table 4.1-8):

Thirteen analytes are analyzed by HPLC using a UV detector. Confirmation is performed by a second column analysis.

ECL Method 734-N-Methylcarbamate Pesticides (Table 4.1-9):

Ten carbamate pesticides are analyzed by HPLC with post-column derivatization and fluorescence detection. Confirmation is normally not required due to the specificity of the method.

ECL Method 736-Dinitroaromatic Compounds and Dinoseb (Table 4.1-10):

Twelve dinitroaromatic compounds, including some selected herbicides and fungicides, are analyzed by high performance liquid chromatography (HPLC) with a UV detection. Confirmation is performed by thin-layer chromatography (TLC) or by GC-MS. ECL is also working on a HPLC/MS confirmation procedure.

ECL Method 740 - MOCA:

4,4'-methylenebis(2-chloroaniline) (MOCA), CAS # 101-14-4, in soils is analyzed by a HPLC/UV technique developed at ECL. Confirmation is by GC or GC-MS.

Guide for the Analysis of Petroleum Hydrocarbon Residues:

Use the table below as a guideline for requesting the analysis of petroleum hydrocarbon residues or oily residues.

GUIDE FOR THE ANALYSIS OF PETROLEUM HYDROCARBON RESIDUES

Suspected	Water	Solids Soil, Sludge	What is Measured ?	Is method constituent specific?	Is method quantitative?
Gasoline / GROs	EPA 8015B (GC/FID)	EPA 8015B	gasoline & GROs	No	semi**
Diesel / DROs	EPA 8015B (GC/FID)	EPA 8015B	diesel & DROs	No	semi**
Motor oil / MOROs	ECL 816-S (GC/FID)	ECL 816-S	Motor oil & MOROs	No	semi**
BTEX , Aromatics	EPA 8260B (GC/MS)	EPA 8260B	BTEX, aromatic VOCs	Yes	Yes
TPH	EPA 1664 (Gravimetric)	EPA 1664 (modified)	n-hexane extractable -silica gel treated non-volatile petroleum hydrocarbons	No	semi**
Oil and Grease	EPA 1664 (Gravimetric)	EPA 1664 (modified)	n-hexane extractable non-volatile organics (petroleum hydrocarbons, oils, animal fats, vegetable oils, waxes & related matter.)	No	semi**
PAHs	EPA 8270C (GC/MS) EPA 8310 (HPLC)	EPA 8270C EPA 8310	polynuclear aromatic hydrocarbons (8310 normally offers lower QLs than 8270C)	Yes Yes	Yes Yes
Unknown volatile organics	EPA 8260B (GC/MS)	EPA 8260B	volatile organics	Yes	Yes*
Unknown semivolatile organics	EPA 8270C (GC/MS)	EPA 8270C	semivolatile organics	Yes	Yes*

NOTES:

GROs = gasoline range organics, C6 - C12
DROs = diesel range organics, C10 - C23
MOROs = motor oil range organics, C19 - C32

VOCs = volatile organic compounds
TPH = total petroleum hydrocarbons
QLs = quanititation limits
* = semi-quantitative for non-target analytes
** = since constituents are non-specific, the results are not analyte specific

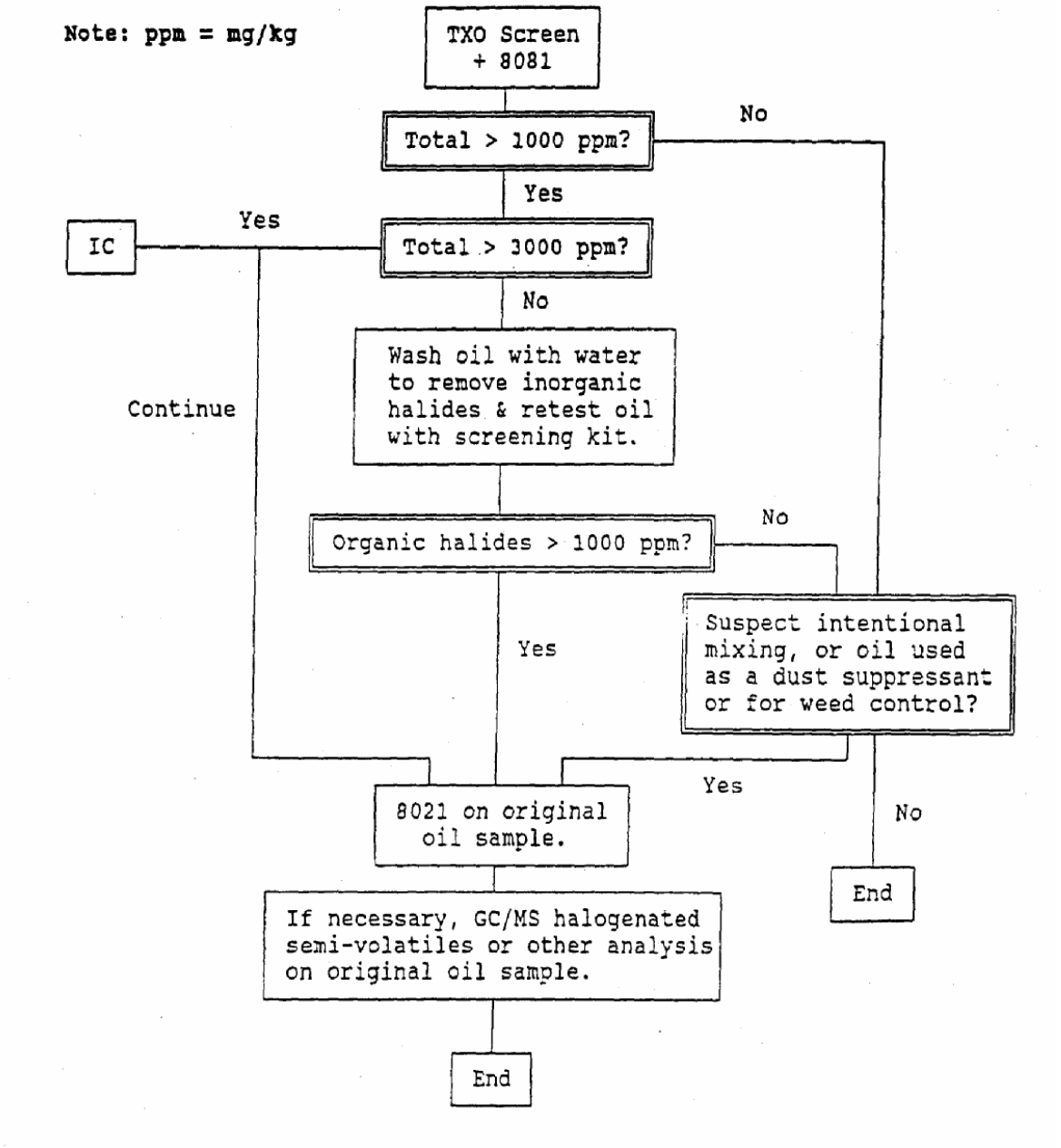
ECL Method 792 - Total Halogens in Oil (TXO):

The Chlor-D-Tect kit is used to screen oil samples for total halogen content. Results from this screening procedure are reported as ppm chloride, regardless of the actual halogen present (fluoride not included). The TXO procedure actually involves a number of sequentially assigned analytical procedures, depending on the outcome of the Chlor-D-Tect screening. Since PCBs are regulated at a much lower level than total organic halogens, a PCB analysis is automatically performed regardless of the TXO level. Further analysis is generally not required if the screening result indicates a halogen level ≤1000 ppm. On the other hand, a result >1000 ppm requires that additional steps be taken as illustrated in the following diagram.

EPA Method 8315 - Formaldehyde (carbonyl compounds):

Formaldehyde analyzed by HPLC and UV detection. Confirmation is not performed, usually samples are collected from known background contamination.

Total Halogens in Oil Analysis



Guide for Requesting the Toxicity Characteristic Leaching Procedure (TCLP) - GC, HPLC, and GC-MS methods:

The TCLP is an extraction procedure using an acetic acid buffer solution that is designed to test the leachability of solid waste for certain toxic organic and inorganic (see Section 4.1.3.3. Part 5) constituents. The TCLP extract produced is treated as a liquid sample and analyzed by the appropriate methods. Oily wastes warrant special consideration. Because oily wastes present a difficult problem in the TCLP (premature clogging of the filter during filtration), a "totals" analysis for the analytes of concern will be performed first to determine if the TCLP is required.

A request for TCLP organics should be specified by the compound class or the analyte(s) suspected to be in the sample. For this analysis, only the TCLP analytes will be analyzed and quantitated. Please use the following categories.

TCLP Volatiles:

TCLP extracts are screened by EPA Method 8260. Quantitation and confirmation are performed by EPA 8260 for only the TCLP volatiles listed in Table 4.1-11.

TCLP Semivolatile Acid/Base/Neutrals:

TCLP extracts are analyzed by EPA Method 8270 acid/ base/neutrals for only the TCLP semivolatile acid/base/neutrals listed in Table 4.1-12. If the Sample Analysis Request does not specify which TCLP-semivolatile group is to be determined, both TCLP semivolatile base-neutrals and acids are determined.

TCLP Cl Pesticides (GC):

TCLP extracts are analyzed by EPA Method 8081 for only the TCLP chlorinated pesticides listed in Table 4.1-13.

TCLP Herbicides (GC):

TCLP extracts are analyzed by EPA Method 8150 for only the TCLP herbicides listed in Table 4.1-14.

4.1.3.3 Inorganic Analysis.

1) Metals:

If significant levels of toxic metals are suspected, request "Metals, WET if necessary."

A total metals analysis is first performed to determine if a sample is hazardous by exceeding the corresponding Total Threshold Limit Concentration (TTLC) values for metals listed in Table II, Title 22, California Code of Regulations (5/31/91), 66261.24(a)(2)(A) . If the result is less than the TTLC, but greater than 10 times the corresponding Soluble Threshold Limit Concentration (STLC) value, a Waste Extraction Test (WET) will be performed (see 4.1.3.3. Part 4). If the concentration of a substance in the (WET) extract (in mg/L) is greater than the corresponding Soluble Threshold Limit Concentration, then the sample is "hazardous". The scheme for the metals analysis is shown below in Figure 4.4-1.

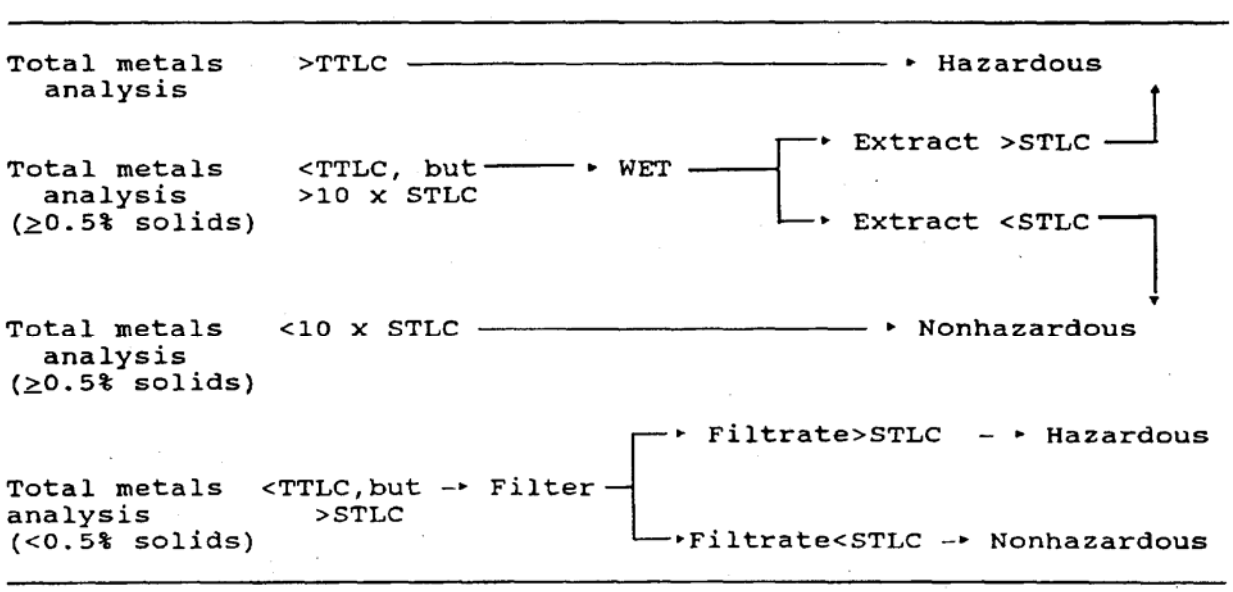


Figure 4.4-1. Metals Analysis Scheme

Table 4.1-15 lists the 14 metals that are routinely analyzed by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES). Flame atomic absorption spectroscopy (FAAS) is also used routinely for the confirmation and the analysis of metals. Due to different sample preparation requirements, antimony, silver, mercury and hexavalent chromium are not included in the routine ICP-AES metal scan, so they should be specifically requested if they are suspected to be present in a sample. The laboratory should also be informed if a water sample requires drinking water detection limits for metals. Use of the heated graphite furnace atomic absorption spectrometer (HGA-AAS) for individual metals (tedious and time consuming) may be necessary to attain the low detection limits required for the

drinking water criteria. Overall, methods selection is dependent on the analyte and detection limit requirement.

2) Anions:

The anions listed in Table 4.1-16 are routinely analyzed by ion chromatography (IC). Cyanide or sulfide analysis (tedious and time consuming) is accomplished by an acid distillation of the sample, followed by a colorimetric determination of the distillate. Individual spot tests may also be requested to qualitatively screen for cyanide, nitrate, nitrite, fluoride, chloride, bromide, sulfate, sulfite and/or sulfides in a sample. Spot test results are generally reported as positive or negative for that anion.

3) Organolead:

Organolead samples require a solvent extraction workup, then flame AA analysis. The results are reported as total organolead. Speciation of tetraalkyl leads is currently not performed.

4) Hg Analyses:

By cold vapor spectrophotometric techniques.

5) Waste Extraction Test (WET):

The WET utilizes a 48-hour extraction with a citric acid buffer solution (pH 5) to determine the leachability of metals from solid wastes as described in Title 22, California Code of Regulation, Chapter 11, Article 5, Appendix II. However, a total metals analysis is normally requested and performed on a sample before the WET. The WET (if requested) is performed only when the total concentration of a toxic metal is less than its TTLC (Total Threshold Limit Concentration) value, but greater than 10 times its STLC (Soluble Threshold Limit Concentration) value.

Note: It not necessary to perform the WET for the toxic organic compounds, since their TTLC values are exactly 10 times their respective STLC values.

6) TCLP for Metals:

The TCLP utilizes an 18 $\pm$ 2 hour extraction with an acetic acid buffer solution (pH 2.88 or 4.93) to determine the leachability of metals from solid wastes as described in EPA Method 1311.

Note: ECL studies have indicated that the WET is more aggressive than the TCLP in leaching metals from solid waste.

4.1.3.4 Special Analysis Requests:

As mentioned previously, ECL is capable of analyzing and characterizing unknown solid or liquid samples that cannot be identified, quantified or characterized by routine analysis. Although resources are limited, ECL also has the expertise and instrumentation to develop and perform difficult, non-routine analyses that may not be available from commercial laboratories. The requestor should consult with laboratory prior to submitting a request for this service. Examples of non-routine analysis are:

1) Polychlorinated Dibenzodioxins and Dibenzofurans:

ECL has developed methods for the trace analysis of polychlorinated dibenzodioxins and dibenzofurans in environmental and biological samples. The analysis is performed by GC/MS and is toxic-isomer specific for the determination of 2,3,7,8-Tetrachlorodibenzodioxin (2378-TCDD) equivalents. Total congener group concentrations are also reported. Detection limits are at the parts per trillion range. Because the clean up procedures, instrument analysis and data processing are long and laborious, the analysis is expensive. Please contact the Trace Analysis Group (8-571-3624) for information about sample containers, current turn-around time estimates, or specifics of the analysis.

ECL has also developed a faster screening method for PCDD/Fs that is based on measuring the OCDD and OCDF concentrations by gas chromatography with electron capture detection. Its use is intended for those cases where a large number of samples must be taken to characterize the site and where OCDD and OCDF are appropriate surrogates for PCDD/Fs. Our current facilities with this screening method are limited, and its use will be made on a case by case basis.

2) Congener-specific PCBs

ECL has developed methods for the analysis of specific PCB congeners at trace levels. As opposed to the determination of PCBs as Aroclors, congener-specific analysis allows the measurement of individual PCBs. The widest application of such technique is for human and ecological risk assessment, where a few toxic PCB congeners are of special interest. The technique involves laborious sample cleanup and HRGC-HRMS analysis and it is time consuming and expensive. For information about the appropriateness and availability of this type of analysis, contact the Trace Analysis Group (8-571-3624).

Table 4.1-0 lists the WHO / International Toxic Equivalency Factors.

ISOMER	POTENCY FACTOR I-TEF
2,3,7,8-TCDD	1.0
1,2,3,7,8-PeCDD	1.0
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.0001
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDF	0.5
2,3,4,7,8-PeCDF	0.1
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
OCDF	0.0001

Table 4.1-0 TCDD Toxic Equivalent WHO/I-TEQ System for Dioxins, Furans, and dioxide-like PCBs.

4) Qualitative analysis of unknowns:

Qualitative analysis for unknowns may be performed by a variety of different techniques, depending on the sample. GC/MS, and Fourier transform infrared spectroscopy (FTIR) are some the available instrumentation employed by ECL to identify unknowns. Consult with ECL if this service is required.

5) Aquatic Toxicity Testing (Fish Bioassays:

A 96 hour LC_{50} aquatic toxicity testing using fathead minnows, rainbow trout or golden shiners is available as a special request and requires prior approval by ECL. The test is performed by ECL's contract laboratories. See Title 22, California Code of Regulations (5/31/91), 66261.24(a)(6) for the toxicity criteria.

Table 4.1-1. 8260B Volatile Organics

Acetone	CAS# 67-64-1	2,2-dichloropropane	594-20-7
Benzene	71-43-2	1,1-dichloropropene	563-58-6
Bromobenzene	108-86-1	cis-1,3-Dichloropropene	10061-01-5
Bromochloromethane	74-97-5	trans-1,3-Dichloropropene	10061-02-6
Bromodichloromethane	75.27-4	Ethylbenzene	100-41-4
Bromoform	75.25-2	Hexachlorobutadiene	87-68-3
Bromomethane	74-83-9	2-hexanone (MBK)	591-78-6
2-Butanone (MEK)	78-93-3	Isopropylbenzene	98-82-8
n-Butylbenzene	104-51-8	p-Isopropyltoluene	99-87-6
sec-Butylbenzene	135-98-8	methyl tertiary butyl ether **	16434-04-4
tert-Butylbenzene	98-06-6	4-methyl-2-pentanone(MIBK)	108-10-1
Carbon tetrachloride	56-23-5	Methylene chloride(Dichloromethane)	75-09-2
Chlorobenzene	108-90-7	Naphthalene	91-20-3
Chloroethane	75-00-3	N-propylbenzene	103-65-1
Chloroform	67-66-3	Styrene	100-42-5
Chloromethane	74-87-3	1,1,1,2-tetrachloroethane	630-20-6
2-chlorotoluene	95-94-8	1,1,2,2 Tetrachloroethane	79-34-5
4-chlorotoluene	106-43-4	Tetrachloroethene	127-18-4
Dibromochloromethane	124-48-1	Toluene	108-88-3
1,2-Dibromo-3-chloropropane**	96-12-8	1,2,3-Trichlorobenzene	87-61-6
1,2-Dibromoethane	106-93-4	1,2,4-Trichlorobenzene	120-82-1
Dibromomethane	74-95-3	1,1,1-Trichloroethane	71-55-6
1,2-Dichlorobenzene	95-50-1	1,1,2-Trichloroethane	79-00-5
1,3-Dichlorobenzene	541-73-1	Trichloroethene	79-01-6
1,4-Dichlorobenzene	106-46-7	Trichlorofluoromethane	75-69-4
Dichlorodifluoromethane	75-71-8	1,2,3-Trichloropropane	96-18-4
1,1-Dichloroethane	75-34-3	1,2,4-Trimethylbenzene	95-63-6
1,2-Dichloroethane	107-06-2	1,3,5-Trimethylbenzene	108-67-8
1,1-Dichloroethene	75-35-4	Vinyl chloride	75-01-4
cis-1,2-Dichloroethene	156-59-2	m & p-Xylene(s)	108-38-3
trans-1,2-Dichloroethene	156-60-5	0-Xylene	95-47-6
1,2-dichloropropane	78-87-5		
1,3-dichloropropane	142-28-9	** Determined by special request only.	

Table 4.1-2. 8270 Semivolatile Organics

Acenaphthene	CAS# 83-32-9	2,4-Dinitrotoluene	121-14-2
Acenaphthylene	208-96-8	2,6-Dinitrotoluene	606-20-2
Aniline	62-53-3	Di-n-octyl phthalate	117-84-0
Anthracene	120-12-7	Fluoranthene	206-44-0
Benzo(a)anthracene	56-55-3	Fluorene	86-73-7
Benzo(b)fluoranthene	205-99-2	Hexachlorobenzene	118-74-1
Benzo(k)fluoranthene	207-08-9	Hexachlorobutadiene	87-68-3
Benzo(g,h,i)perylene	191-24-2	Hexachlorocyclopentadiene	77-47-4
Benzo(a)pyrene	50-32-8	Hexachloroethane	67-72-1
Benzyl alcohol	100-51-6	Indeno(1,2,3-cd)pyrene	193-39-5
Bis(2-chloroethoxy)methane	111-91-1	Isophorone	78-59-1
Bis(2-chloroethyl) ether	111-44-4	2-Methylnaphthalene	91-57-6
Bis(2-chloroisopropyl) ether	108-60-1	2-Methylphenol	95-48-7
Bis(2-ethylhexyl) phthalate	117-81-7	4&3-Methylphenol	106-44-5
4-Bromophenyl phenyl ether	101-55-3	Naphthalene	91-20-3
Butyl benzyl phthalate	85-68-7	2-Nitroaniline	88-74-4
Carbazole	86-74-8	3-Nitroaniline	99-09-2
4-Chloroaniline	106-47-8	4-Nitroaniline	100-01-6
1-Chloronaphthalene	90-13-1	Nitrobenzene	98-95-3
2-Chloronaphthalene	91-58-7	2-Nitrophenol	88-75-5
4-Chloro-3-methylphenol	59-50-7	4-Nitrophenol	100-02-7
2-Chlorophenol	95-57-8	N-Nitrosodimethylamine **	62-75-9
4-Chlorophenyl phenyl ether	7005-72-3	N-Nitrosodiphenylamine	86-30-6
Chrysene	218-01-9	N-Nitrosodipropylamine	621-64-7
Dibenz(a,h)anthracene	53-70-3	Pentachlorophenol	87-86-5
Dibenzofuran	132-64-9	Phenanthrene	85-01-8
Di-n-butyl phthalate	84-74-2	Phenol	108-95-2
1,3-Dichlorobenzene	541-73-1	Pyrene	129-00-0
1,4-Dichlorobenzene	106-46-7	Pyridine ***	110-86-1
1,2-Dichlorobenzene	95-50-1	1,2,4-Trichlorobenzene	120-82-1
3,3'-Dichlorobenzidine	91-94-1	2,4,5-Trichlorophenol	95-95-4
2,4-Dichlorophenol	120-83-2	2,4,6-Trichlorophenol	88-06-2
Diethyl phthalate	84-66-2		
2,4-Dimethylphenol	105-67-9		
Dimethyl phthalate	131-11-3		
4,6-Dinitro-2-methylphenol	534-52-1		
2,4-Dinitrophenol	51-28-5		

** Determined by special request only
*** Determined if TCLP-Semivolatile Organics is requested

Table 4.1-3. 8082 Polychlorinated Biphenyls (PCBs)

Aroclor 1016	CAS # 12674-11-2	Aroclor 1248	12672-29-6
Aroclor 1221	11104-28-2	Aroclor 1254	11097-69-1
Aroclor 1232	11141-16-5	Aroclor 1260	11096-82-5
Aroclor 1242	53469-21-9	Aroclor 1262	37324-23-5

4.1-4. 8081 Organochlorine Pesticides

delta-BHC	CAS # 319-86-8	Dieldrin	60-57-1
alpha-BHC	319-84-6	o,p'-DDD **	53-19-0
beta-BHC	319-85-7	Endrin	72-20-8
gamma-BHC (Lindane)	58-89-9	Endrin aldehyde	7421-93-4
PCNB **	82-68-8	Endosulfan sulfate	1031-07-8
Heptachlor	76-44-8	Endosulfan II	33213-65-9
Aldrin	309-00-2	p,p'-DDD	72-54-8
Heptachlor epoxide	1024-57-3	o,p'-DDT **	789-02-6
alpha-Chlordane	5103-71-9	p,p'-DDT	50-29-3
o,p'-DDE **	3424-82-6	p,p'-Methoxychlor	72-43-5
Endosulfan I	959-98-8	Tedion **	116-29-0
gamma-Chlordane	5103-74-2	Mirex	2385-85-5
p,p'-DDE	72-55-9	Toxaphene	8001-35-21

** Note: Included only by special request.

Table 4.1-5. 8141A Organophosphorus Pesticides

Dichlorvos (DDVP)	CAS # 62-73-7	Fonofos (Dyfonate)	944-22-9
Demeton-O	8065-48-3	Disulfoton (DisySMOn)	298-04-4
Phorate (Thimet)	298-02-2	Demeton-S	8065-48-3
Ethoprop (Mocap)	13194-48-4	Chlorpyrifos	2921-88-2
Diazinon	333-41-5	Dimethoate **	60-51-5
Ronnel	299-84-3	Monocrotophos **	6923-22-4
Fenthion (Baytex)	55-38-9	Parathion, methyl	298-00-0
Tokuthion **	34643-46-4	Malathion	121-75-5
DEF (Butifos) **	78-48-8	Chlorfenvinphos **	470-90-6
Parathion, ethyl	56-38-2	Methidathion **	950-37-8
Trithion	786-19-6	Ethion	563-12-2
Phospholan **	947-02-4	Leptophos	21609-90-5
Fensulfothion **	115-90-2	EPN	2104-64-5
Phosmet	732-11-6	Azinphos, methyl	86-50-0
Azinphos, ethyl	2642-71-9	Famphur **	52-85-7
Mevinphos	7786-34-7	Coumaphos	56-72-4
Sulfotepp **	3689-24-5		

** Note: Included only by special request.

Table 4.1-6. 8151A Chlorinated Herbicides

2,4-D	CAS # 94-75-7	Dichlorprop	120-36-5
2,4,5-T	93-76-5	MCPA	94-74-6
2,4-DB	94-82-6	Dalapon	75-99-0
2,4,5-TP (Silvex)	93-72-1	Dinoseb	88-85-7
Dicamba	1918-00-9	MCPP	93-65-2

Table 4.1-7. 8310 Polynuclear Aromatic Hydrocarbons (PAHs or PNAs)

Naphthalene	CAS # 91-20-3	Benzo(a)anthracene	56-55-3
Acenaphthylene	208-96-8	Chrysene	218-01-9
Acenaphthene	83-32-9	Benzo(b)fluoranthene	205-99-2
Fluorene	86-73-7	Benzo(k)fluoranthene	207-08-9
Phenanthrene	85-01-8	Benzo(a)pyrene	50-32-8
Anthracene	120-12-7	Dibenzo(ah)anthracene	53-70-3
Fluoranthene	206-44-0	Benzo(ghi)perylene	191-24-2
Pyrene	129-00-0	Indeno(1,2,3-cd)pyrene	193-39-5

Table 4.1-8. 8330 Nitroaromatics and Nitramines

Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	CAS# 2691-41-0
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4
1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4
Methyl 1-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8
Nitrobenzene (NB)	98-95-3
2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	1946-51-0
2-Amino-4,6-dinitrotoluene (4-Am-DNT)	355-72-78-2
2,4-Dinitrotoluene (2,4-DNT)	121-14-2
2,6-Dinitrotoluene (2,6-DNT)	606-20-2
2-Nitrotoluene (2-NT)	88-72-2
3-Nitrotoluene (3-NT)	99-08-1
4-Nitrotoluene (4-NT)	99-99-0

Table 4.1-9. 734.1 N-Methylcarbamate Pesticides

Aldicarb sulfone	CAS # 1646-88-4	Propoxur (Baygon)	114-26-1
Methomyl (Lannate)	16752-77-5	Carbofuran (Furadan)	1563-66-2
3-Hydroxycarbofuran	16655-82-6	Carbaryl (Sevin)	63-25-2
Dioxacarb	6988-21-2	Methiocarb (Mesurol)	2032-65-7
Aldicarb	116-06-3	Promecarb	2631-37-0

Table 4.1-10. 736 Dinitro-Compounds and Dinoseb

4-Nitrophenol	CAS # 100-02-7	Dinoseb	88-85-7
2,6-Dinitrophenol	573-56-8	Dinitramine (Cobex)	29091-05-2
2,4-Dinitrophenol	51-28-5	Fluchoralin (Basalin)	33245-39-5
3,4-Dinitrophenol	557-71-9	Pendimethalin (Prowl)	40487-42-1
2,5-Dinitrophenol	329-71-5	Trifluralin (Treflan)	1582-09-8
2-Methyl-4,6-dinitrophenol	534-52-1	Dinocap (I and II)	39300-45-3
4,6 Dinitro-o-cresol	121-14-2		

Table 4.1-11. TCLP Volatile Organics with GCMS Method 8260

Benzene	CAS # 71-43-2	1,1-Dichloroethylene	75-35-4
Chlorobenzene	108-90-7	2-Butanone (MEK)	78-93-3
Chloroform	67-66-3	Tetrachloroethene (Tetrachloroethylene)	127-18-4
1,4-Dichlorobenzene	106-46-7	Trichloroethene (Trichloroethylene)	79-01-6
Carbon tetrachloride	56-23-5	Vinyl chloride	75-01-4
1,2-Dichloroethane	107-06-2		

Table 4.1-12. TCLP Semivolatile Organics with GCMS Method 8270

1,4-Dichlorobenzene	CAS # 106-46-7	3-Methylphenol (m-cresol)*	108-39-4
2,4-Dinitrotoluene	121-14-2	4-Methylphenol (p-cresol)*	106-44-5
Hexachlorobenzene	118-74-1	Nitrobenzene	98-95-3
Hexachlorobutadiene	87-68-3	Pentachlorophenol	87-86-5
Hexachloroethane	67-72-1	Pyridine	110-86-1
2-Methylphenol(0-cresol)	95-48-7	2,4,5-Trichlorophenol	95-95-4
		2,4,6-Trichlorophenol	88-06-2

* Compounds coelute - reported as M & P cresol

Table 4.1-13. TCLP Chlorinated Pesticides

Chlordane	CAS # 12789-03-6	Lindane	58-89-9
Heptachlor	76-44-8	Methoxychlor	72-43-5
Endrin	72-20-8	Toxaphene	8001-35-21

Table 4.1-14. TCLP Herbicides

2,4-D	CAS # 94-75-7	2,4,5-TP (Silvex)	93-72-1

Table 4.1-15 EPA 6010B Metals by ICP-AES

As-Arsenic	Ni-Nickel
Ba-Barium	Pb-Lead
Be-Beryllium	Se-Selenium
Cd-Cadmium	Tl-Thallium
Co-Cobalt	V-Vanadium
Cr-Chromium	Zn-Zinc
Cu-Copper	
Mo-Molybdenum	

Table 4.1-16 - Anions Method ECL 960

Fluoride	Nitrate
Chloride	Phosphate
Sulfate	

Table 4.1-21: LIST OF ANALYTICAL METHODS - EPA, ECL, ECL-SC and Contract Labs

Organic Methods

NAME OF METHOD	EPA	ECL	ECL-SC	CONTRACT
4-Chlorobenzene sulfonic acid by Ion Chromatography	_____	732[a] (5)	_____	_____
N-Methylcarbamates	8318 (15)	8318 (15)	8318 (15)	_____
Nitroaromatics & Nitramines by HPLC	8330 (17)	8330 (17)	_____	_____
4,4'-Methylenebis(2-chloroaniline) (MOCA)	_____	740 (5)	_____	_____
Polynuclear Aromatic Hydrocarbons by HPLC	8310 (1)	8310 (1)	8310 (1)	8310 (1)
Volatile Organic Analysis by GC/PID & ELCD	8021 B (17)	8021 B (17)	8021 B (17)	8021 B (17)
Volatile Organosulfur Compounds	_____	760 (5)	_____	_____
Volatile Hydrocarbon Analysis by GC/FID	_____	815 (5)	815 (5)	8015 B (16)
1,2-Dibromoethane(EDB) and 1,2-Dibromo-3-chloropropane(DBCP)	8011 (2)	8011[b] (2)	8011[b] (2)	_____
Diesel Analysis by GC/FID	8015B (16)	8015B (16)	8015B (16)	8015 B (16)
Phenols by GC/FID	8041 (16)	8041 (16)	8041 (16)	8041A(16)
Chlorophenols by Acetylation and GC/ECD	_____	782 (5)	782 (5)	_____
Base & Neutral Extractable Organics by GC/FID	8015 B(16)	8270C (2)	8270 C (2)	8015B(16)
Polynuclear Aromatic Hydrocarbons	8100 (1)	8100 (1)	8100 (1)	8100 (1)
Organochlorine Pesticides	8081A (16)	8081A (16)	8081A (16)	8081A (16)
PCBs	8082 (16)	8082 (16)	8082 (16)	8082 (16))
Organophosphorus Pesticides (Capillary)	8141A(15)	8141A (15)	_____	8141A(15)
Chlorinated Herbicides	8151 A (16)	8151 A (16)	8151 A (16)	8150A (16)
GC/MS Confirmation of Base Neutral & Acid Extractable Organics	_____	835[a] (5)	8270 (2)	_____
GC/MS Method for Volatile Organics: Capillary Column Technique	8260 B (16)	8260B (16)	8260B (16)	_____
GC/MS Method for Semivolatile Organics: Capillary Column Technique	8270 D (17)	8270 A (2)	8270 A (2)	8270 C (16)
GC/MS Headspace Method for Volatile Organics	_____	850 (5)	850 (5)	_____
Screening for Dithiocarbamate Residues in Soil by Headspace Analysis of CS^2	_____	820 (5)	_____	_____
GC/NPD Screening Procedures EPTC Screening in Soil	_____	821 (5)	_____	_____
Malathion and Related Products	_____	841 (5)	_____	_____
OCCC and OCDF by Electron Capture GLC	_____	895 (5)	_____	_____
Analysis of PCDDs and PCDFs by GC/MS; Environmental Samples (Soxhlet)	8280B (17)	880 (5)	_____	8290(15)
Analysis of PCDDs and PCDFs by GC/HRMS; Biological Samples (Stalling)	8290A (17)	880 (5)	_____	8290 (15)
Total Organic Halides	9020 B (15)	9020 A (2)	_____	_____
Total Recoverable Oil & Grease (Gravimetric, Separatory Funnel Extraction)	1664(15)	9070 (1)	9070 (1)	_____
Oil & Grease Extraction Method for Sludge Samples	9071 B (15)	9071 (1)	9071 (1)	_____
Total Recoverable Oil and Grease by Infrared	413.2 (3)	413.2 (3)	413.2 (3)	_____
Total Recoverable Petroleum Hydrocarbons by Infrared	418.1 (3)	418 (3)	418.1 (3)	_____
Total Halogens in Oil	_____	792 (5)	_____	_____

Inorganic Methods

Acid Digestion of Water for Total Recoverable or Dissolved Metals	3005 A (2)	3005 A (2)	_____	_____
Acid Digestion of Aqueous Samples and Extracts for Totals Metals	3010 A (2)	3010 A (2)	_____	_____
Digestion of Solids for Metal Determinations	3050 B (16)	3050 A (2)	3.23 (6)	3050 A (2)
Inductively Coupled Plasma Atomic Emission Spectrometry (ICPAES) 16 metals	6010 C (18)	6010 A (2)	6010 A (2)	6010 B (16)
Inductively Coupled Plasma - Mass Spectrometry	6020 A (17)	6020[b] (10)	_____	_____
Antimony (AA, Direct Aspiration)	7040 (1)	7040 (1)	7040 (1)	7040 (1)
Antimony (AA, Furnace Technique)	7041 (1)	7041 (1)	7041 (1)	7041 (1)
Arsenic (AA, Flame)	7060 A (15)	7060 (1)	_____	7060 A (15)
Arsenic (AA, Furnace Technique)	7061 A (2)	7061 A (2)	7061 A (2)	7061 A (2)
Arsenic (AA, Gaseous Hydride)	7080 A (15)	7080 (1)	7080 (1)	7080 A (15)
Barium (AA, Direct Aspiration)	7081 (2)	7081 (2)	7081 (2)	7081 (2)
Barium (AA, Furnace Technique)	7090 (1)	7090 (1)	7090 (1)	7090 (1)
Beryllium (AA, Direct Aspiration)	7091 (1)	7091 (1)	7091 (1)	7091 (1)
Beryllium (AA, Furnace Technique)	7130 (1)	7130 (1)	7130 (1)	7130 (1)
Cadmium (AA, Direct Aspiration)	7131 A (15)	7131 (1)	7131 (1)	7131 A (15)

NAME OF METHOD EPA ECL ECL-SC CONTRACT

Cadmium (AA, Furnace Technique)	7190 (1)	7190 (1)	7190 (1)	7190 (1)
Chromium (AA, Direct Aspiration)	7191 (1)	7191 (1)	7191 (1)	7191 (1)
Chromium (AA, Furnace technique)	7195 (1)	_____	7195 (1)	7195 (1)
Chromium, Hexavalent (Coprecipitation)	7196 A (2)	7196 A (2)	_____	7196 A (2)
Chromium, Hexavalent (Colorimetric)	7197 (1)	_____	7197 (1)	7197 (1)
Chromium, Hexavalent (Chelation/Extraction)	7200 (1)	7200 (1)	7200 (1)	7200 (1)
Cobalt (AA, Direct Aspiration)	7201 (1)	7201 (1)	7201 (1)	7201 (1)
Cobalt (AA, Furnace Technique)	7210 (1)	7210 (1)	7210 (1)	7210 (1)
Copper (AA, Direct Aspiration)	7211 (2)	7211 (2)	7211 (2)	7211 (2)
Copper (AA, Furnace Technique)	7420 (1)	7420 (1)	7420 (1)	7420 (1)
Lead (AA, Direct Aspiration)	7421 (1)	7421 (1)	7421 (1)	7421 (1)
Lead (AA, Furnace technique)	7470 A (15)	7470 (1)	7470 (1)	7470 A (15)
Mercury in Liquid Waste (Manual Cold Vapor Technique)	7471 B (17)	7471 (1)	7471 (1)	7471 A (16)
Mercury in Solid and Semisolid Waste (Manual Cold Vapor Technique)	7480 (1)	7480 (1)	7480 (1)	7480 (1)
Molybdenum (AA, Direct Aspiration)	7481 (1)	7481 (1)	7481 (1)	7481 (1)
Molybdenum (AA, Furnace Technique)	7520 (1)	7520 (1)	7520 (1)	7520 (1)
Nickel (AA, Direct Aspiration)	7740 (1)	7740 (1)	7740 (1)	7740 (1)
Selenium (AA, Furnace Technique)	7741 A (15)	7741 (1)	7741 (1)	7741 A (15)
Selenium (AA, Gaseous Hydride)	7760 A (2)	7760 A (2)	7760 A (2)	7760 A (2)
Silver (AA, Direct Aspiration)	7761 (2)	7761 (2)	7761 (2)	7761 (2)
Silver (AA, Furnace Technique)	7840 (1)	7840 (1)	7840 (1)	7840 (1)
Thallium (AA, Direct Aspiration)	7841 (1)	7841 (1)	7841 (1)	7841 (1)
Thallium (AA, Furnace Technique)	7910 (1)	7910 (1)	7910 (1)	7910 (1)
Vanadium (AA, Direct Aspiration)	7911 (1)	7911 (1)	7911 (1)	7911 (1)
Vanadium (AA, Furnace Technique)	7950 (1)	7950 (1)	7950 (1)	7950 (1)
Zinc (AA, Direct Aspiration)	7951 (2)	7951 (2)	7951 (2)	7951 (2)
Zinc (AA, Furnace Technique)	_____	938 (5)	_____	_____
Organolead by FAAS	9056 A (18)	300.0 (7)	300.0 (7)	300.0 (7)
Ion Chromatography (F, Cl, NO_3, NO_2, SO_4, Br, PO_4)	_____	965[a] (5)	965[a] (5)	_____
Ion Selective Electrode Method (F, Cl, CN)	_____	970[a] (5)	970[a] (5)	340 (3)
Fluoride	9214 (1)	9251 (1)	_____	325 (3)
Chloride (Colorimetric, Automated Ferricyanide AAII)	9251 (1)	_____	_____	_____
Chloride (Titrimetric, Mercuric Nitrate)	_____	_____	_____	300 (3)
Nitrate	9210A(18)	976[a] (5)	976[a] (5)	300 (3)
Nitrite	354.1	_____	9035 (1)	375 (3)
Sulfate (Colorimetric, Automated Methylthymol)	9036 (1)	9038 (1)	_____	375 (3)
Sulfate (Turbidimetric)	9038 (2)	990 (5)	9010 (1)	9010B(16)
Cyanide	9213 (16)	376.2 (3)	9030 (1)	9215(16)
Sulfide	9215(16)	_____	_____	_____

Miscellaneous Methods

Pensky-Martens Closed-Cup Method for Determining Ignitability	1010 (1)	_____	_____	1010 (1)
Setaflash Closed-Cup Method for Determining Ignitability	1020 A (2)	1020 A (2)	1020 A (2)	1020 A (2)
Flammability of Compressed Gases (Aerosol Products)	_____	720 (14)(5)	_____	_____
Determination of % Dry Solids	(1)	704-S (1)(5)	704-S (1)(5)	(1)
pH Electrometric Measurement	9040B (15)	9040 (1)	9040 (1)	9040 B (15))
Soil pH	9045 C (15)	9045 A (2)	9045 A (2)	9040B(15)
Specific Conductance	9050 A (16)	9050 (1)	9050 (1)	_____
Total Organic Carbon	9060 (1)	_____	_____	_____
California Waste Extraction Test (WET)	_____	910 (5)	910 (5)	66700 (8)
EP Toxicity Extraction	1310 A (2))	1310 (1)	1310 (1)	1310A(2)
Toxicity Characteristic Leaching Procedure (TCLP)	1311(2)	1311 (2)	1311(2)	1311 (2)

Miscellaneous Methods Other Laboratories

NAME OF METHOD	EPA	ECL	ECL-SC	CONTRACT/ AIHL/SRL
Fish Bioassay	_____	66696 (8)	_____	66261.24(a)(16)
Corrosivity	_____	66708 (8)	_____	66261.22
Reactivity	_____	66705 (8)	_____	66261.23)
Asbestos	_____	_____	_____	Appendix IV, Table 4,
Acidity	305.1 (3)	_____	_____	305.1 (3)
Alkalinity	310.1 (3)	_____	_____	310.1 (3)
Chemical Oxygen Demand	410.1 (3)	_____	_____	410.1 (3)
Soil Gas	_____	_____	_____	TO 14A(MS)

Notes: [a] Analyses performed, method not available in SOP format.
[b] Planned for future; projected date: XX-XX-90.
[c] Planned for future; projected date: XX-XX-90.

References:

1. Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW846, U.S.EPA, 3rd edition, September 1986.
2. Update I, July 1992, for SW-846, 3rd edition.
3. Methods for Chemical Analysis of Water and Wastes, EPA600/479020, Revised March 1983.
4. Method 531. Measurement of N-Methyl Carbamoyloximes and N-Methyl carbamates in Drinking Water by Direct Aqueous Injection HPLC with Post Column Derivatization, EPA/600/485/054.
5. ECL Method.
6. ECL-SC Method.
7. Method 300.0, EPA600/484017 series.
8. California Administrative Code, Title 22, Chapter 30, Article 11, "Criteria for Identification of Hazardous and Extremely Hazardous Waste".
9. Method 632, The determination of Carbamate and Urea pesticides in industrial and municipal waste, EPA600/482014.
10. Draft Methods.
11. EPA Draft Methods for Drinking Water.
12. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA600/482057.
13. EPA Draft Methods for Wastewater.
14. ASTM Method
15. Update II B, September 1994, for SW-846, 3rd Edition.
16. Update III, December 1996, for SW-846, 3rd Edition.
17. Update IVA, for SW-846
18. Update IVB, for SW-846

Table 4.1-22: LIST OF ANALYTICAL METHODS - EPA Equivalent Methods

Organic Methods

NAME OF METHOD	SOLID WASTE	DRINKING WATER	WASTEWATER
Volatile Organic Halides	_____	502.1 (11)	601 (12)
1,2-Dibromoethane and 1,2-Dibromo-3-Chloropropane	8011 (2)	504 (11)	_____
Non-Halogenated Volatile Organics	8015 C (18)	_____	_____
Aromatic Volatile Organics	_____	503.1 (11)	602 (12)
Volatile Organic Compounds in by Purge-and-Trap Capillary Column GC	8021 B (16)	502.2 (11)	_____
Acrolein, Acrylonitrile, Acetonitrile	_____	_____	603 (12)
Phenols by GC/FID and ECD confirmation	_____	_____	604 (12)
Benzidine	…	_____	605 (12)
Phthalate Esters	8061 A(16)	_____	606 (12)
Nitrosamines	8070 A (16)	_____	607 (12)
Organochlorine Pesticides and PCBs	_____	_____	608 (12)
Organochlorine Pesticides and PCBs	8081 B(18))	508 (11)	_____
Nitroaromatics and Cyclic Ketones	8091 (16)	_____	609 (12)
Polynuclear Aromatic Hydrocarbons by GC/FID	8100 (1)	_____	610(12)
Haloethers	8111 (16)	_____	611 (12)
Chlorinated Hydrocarbon	8121 (14)	_____	612 (12)
Organophosphorus Pesticides	_____	_____	614(12)
Organophosphorus Pesticides Capillary Column	8141 B (17)	507 (11)	_____
Chlorinated Herbicides	8151A (16)	515 (11)	615(12)
GC/MS Method for Volatile Organics: Packed Column Technique	_____	524.1 (11)	624 (12)
GC/MS Method for Semivolatile Organics: Packed Column Technique	_____	_____	625 (12)
GC/MS Method for Semivolatile Organics: Capillary Column Technique	8260 B (16))	524.2 (11)	_____
GC/MS Method for Volatile Organics: Capillary Column Technique	8270 D (17)	_____	_____
The Analysis of PCDDs and PCDFs	8280 B (17))	_____	_____
PCDDs and PCDFs by HRGC/HRMS	8290 A(17)	_____	_____
Carbamates	_____	531 (4)	632 (9)
Polynuclear Aromatic Hydrocarbons by HPLC	8310 (1)	_____	610 (12)
VOC by Isotope Dilution	_____	_____	1624(12)
SVOC by Isotope Dilution GC/MS	_____	_____	1625(12)

Inorganic Methods

Inductively Coupled Plasma Atomic Emission Spectrometry (ICPAES) (16 metals)	6010 C (18)	200.7 (3)	200.7 (3)
Aluminum (AA, Direct Aspiration)	7020 (2)	202.1 (3)	202.1 (3)
Antimony (AA, Direct Aspiration)	7040 (1)	204.1 (3)	204.1 (3)
Antimony (AA, Furnace Technique)	7041 (1)	204.2 (3)	204.2 (3)
Arsenic (AA, Furnace Technique)	7060 A (14)	206.2 (3)	206.2 (3)
Arsenic (AA, Gaseous Hydride)	7061 A (2)	206.3 (3)	206.3 (3)
Barium (AA, Direct Aspiration)	7080 A (14)	208.1 (3)	208.1 (3)
Beryllium (AA, Direct Aspiration)	7090 (1)	210.1 (3)	210.1 (3)
Beryllium (AA, Furnace Technique)	7091 (1)	210.2 (3)	210.2 (3)
Cadmium (AA, Direct Aspiration)	7130 (1)	213.1 (3)	213.1 (3)
Cadmium (AA, Furnace Technique)	7131 A (14)	213.2 (3)	213.2 (3)
Chromium (AA, Direct Aspiration)	7190 (1)	218.1 (3)	218.1 (3)
Chromium (AA, Furnace technique)	7191 (1)	218.2 (3)	218.2 (3)
Chromium, Hexavalent (Coprecipitation)	7195 (1)	218.5 (3)	218.5 (3)
Chromium, Hexavalent (Colorimetric)	7196 A (2)	_____	_____
Chromium, Hexavalent (Chelation/Extraction)	7197 (1)	218.4 (3)	218.4 (3)
Chromium, Hexavalent (Differential Pulse Polarography)	7198 (1)	_____	_____
Cobalt (AA, Direct Aspiration)	7200 (1)	219.1 (3)	219.1 (3)
Cobalt (AA, Furnace Technique)	7201 (1)	219.2 (3)	219.2 (3)
Copper (AA, Direct Aspiration)	7210 (1)	220.1 (3)	220.1 (3)
NAME OF METHOD	SOLID WASTE	DRINKING	WASTEWATER

NAME OF METHOD	SOLID WASTE	DRINKING WATER	WASTEWATER
Iron (AA, Direct Aspiration)	7380 (2)	236.1 (3)	236.1 (3)
Lead (AA, Direct Aspiration)	7420 (1)	239.1 (3)	239.1 (3)
Lead (AA, Furnace Technique)	7421 (1)	239.2 (3)	239.2 (3)
Lithium (AA, Direct Aspiration)	7430 (2)	_____	_____
Magnesium (AA, Direct Aspiration)	7450 (1)	242.1 (3)	242.1 (3)
Manganese (AA, Direct Aspiration)	7460 (1)	243.1 (3)	243.1 (3)
Mercury in Liquid Waste (Manual Cold Vapor Technique)	7470 A (14)	245.1 (3)	245.1 (3)
Mercury in Solid and Semisolid Waste (Manual Cold Vapor Technique)	7471B (17)	_____	_____
Molybdenum (AA, Direct Aspiration)	7480 (1)	246.1 (3)	246.1 (3)
Molybdenum (AA, Furnace Technique)	7481 (1)	246.2 (3)	246.2 (3)
Nickel (AA, Direct Aspiration)	7520 (1)	249.1 (3)	249.1 (3)
Osmium (AA, Direct Aspiration)	7550 (2)	252.1 (3)	252.1 (3)
Potassium (AA, Direct Aspiration)	7610 (2)	258.1 (3)	258.1 (3)
Selenium (AA, Furnace Technique)	7740 (1)	270.2 (3)	270.2 (3)
Selenium (AA, Gaseous Hydride)	7741 A (14)	270.3 (3)	270.3 (3)
Silver (AA, Direct Aspiration)	7760 A (2)	272.1 (3)	272.1 (3)
Sodium (AA, Direct Aspiration)	7770 (1)	273.1 (3)	273.1 (3)
Strontium (AA, Direct Aspiration)	7780 (2)	_____	_____
Thallium (AA, Direct Aspiration)	7840 (1)	279.1 (3)	279.1 (3)
Thallium (AA, Furnace Technique)	7841 (1)	279.2 (3)	279.2 (3)
Tin (AA, Direct Aspiration)	7870 (1)	282.1 (3)	282.1 (3)
Vanadium (AA, Direct Aspiration)	7910 (1)	286.1 (3)	286.1 (3)
Vanadium (AA, Furnace Technique)	7911 (1)	286.2 (3)	286.2 (3)
Zinc (AA, Direct Aspiration)	7950 (1)	289.1 (3)	289.1 (3)
Ion Chromatography (F, Cl, NO_3, NO_2, SO_4, Br, PO_4)	9056 A (18)	300.0 (7)	300.0 (7)
Sulfate (Colorimetric, Automated, Chloranilate)	9035 (1)	375.1 (3)	375.1 (3)
Sulfate (Colorimetric, Automated, Methylthymol Blue AA II)	9036 (1)	375.2 (3)	375.2 (3)
Sulfate (Turbidimetric)	9038 (1)	375.4 (3)	375.4 (3)
Total Amenable Cyanide (Colorimetric, Manual)	9010 B (16)	335.2 (3)	335.2 (3)
Total Amenable Cyanide (Colorimetric, Automated UV)	9012 A (16)	335.3 (3)	335.3 (3)
Total Organic Halides (TOX)	9020 B (14)	_____	_____
Purgeable Organic Halides (POX)	9021 (2)	_____	_____
Total Organic Halides (TOX) by Neutron Activation Analysis	9022 (1)	_____	_____
Acid-Soluble and Acid-Insoluble Sulfides	9030 B (6)	_____	_____
Extractable Sulfides	9031 (2)	376.1 (3)	376.1 (3)
Total Organic Carbon	9060 (1)	415.1 (3)	415.1 (3)
Phenolics (Spectrophotometric, Manual 4-AAP	9065 (1)	420.1 (3)	420.1 (3)
Phenolics (Colorimetric, Automated, 4-AAP	9066 (1)	420.2 (3)	420.2 (3)
Phenolics (Spectrophotometric, MBTH with Distillation)	9067 (1)	420.3 (3)	420.3 (3)
Total Recoverable Oil & Grease (Gravimetric, Separatory Funnel Extraction)	9070 (1)	413.1 (3)	413.1 (3)
Oil & Grease Extraction Method for Sludge Samples	9071 A (14)	_____	_____
Total Recoverable Oil and Grease by Infrared	_____	413.2 (3)	413.2 (3)
Total Recoverable Petroleum Hydrocarbons by Infrared	_____	418.1 (3)	418.1 (3)
Nitrate	_____	354 (3)	354 (3)
Nitrite	_____	352 (3)	352 (3)
Fluoride	_____	340 (3)	340 (3)
Chloride (Colorimetric, Automated Ferricyanide AAI)	9250 (1)	325.1 (3)	325.1 (3)
Chloride (Colorimetric, Automated Ferricyanide AAII)	9251 (1)	325.2 (3)	325.2 (3)
Chloride (Titrimetric, Mercuric Nitrate)	_____	325.3 (3)	325.3 (3)
Chloride (Titrimetric, Silver Nitrate)	9253 (14)	_____	_____

Miscellaneous Methods			
Pensky-Martens Closed-Cup Method for Determining Ignitability	1010 (1)	_____	_____
Setaflash Closed-Cup Method for Determining Ignitability	1020 A (2)	_____	_____
Extraction Procedure (EP) Toxicity Test	1310 A (2)	_____	_____
Acidity	_____	305.1 (3)	305.1 (3)
Alkalinity	_____	310.1 (3)	310.1 (3)
pH Electrometric Measurement	9040 B (14)	150.1 (3)	150.1 (3)
Soil pH	9045 C (2)	_____	_____
Specific Conductance	9050 A(16)	120.1 (3)	120.1 (3)
Chemical Oxygen Demand	_____	410.1 (3)	410.1 (3)

References

1. Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846, U.S.EPA, 3rd edition, September 1986.
2. Update I, July 1992, for SW-846, 3rd edition.
3. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983.
4. Method 531. Measurement of N-Methyl Carbamoyloximes and N-Methyl carbamates in Drinking Water by Direct Aqueous Injection HPLC with Post Column Derivatization, EPA/600/4-85/054.
5. ECL Method.
6. ECL-SC Method.
7. Method 300.0, EPA-600/4-84-017 series.
8. California Administrative Code, Title 22, Chapter 30, Article 11, "Criteria for Identification of Hazardous and Extremely Hazardous Waste".
9. Method 632, The determination of Carbamate and Urea pesticides in industrial and municipal waste, EPA-600/4-82-014.
10. Draft Methods.
11. EPA Draft Methods for Drinking Water.
12. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057. http://www.epa.gov/ostwater/Tools/guide/methods.html
13. EPA Draft Methods for Wastewater.
14. Update IIB, Sept. 1994, for SW-846, 3rd Edition

TABLE 4.1-23

ECL IN-HOUSE METHODS

Method#	Title of Method	Status (date completed)			
		Draft	Operational	Validated	Archived
3.24-M	Acid Digestion of Sediment, Sludge, and Soil				4/18/90
418-M (SCL)	Total Petroleum Hydrocarbons Spectrophotometric, Infrared				8/91
705-M	Analysis of Particulates not Otherwise Regulated, Total				1/11/96
720-M	**Flammability of Compressed Gasses (Aerosol Products)**				**9/12/02***
732-M	4-Chlorobenzene Sulfonic Acid by Ion Chromatography	pending			
736-M	**Dinitroaromatics by HPLC**				**6/18/03***
740-M	4,4'-Methylenebis(2-Chloraniline)-MOCA				2/10/98
750-M	**Determination of Polybromodiphenyl Ethers in E-Waste and Solid Matrices by Gas Chromatography**		**10/16/03***		
760-M	**Volatile Organosulfur Compounds**				**3/15/01***
768-M	Diesel by GC/FID				4/7/98
772-M	**2-Butoxyethanol in Water by GC/FID**		**9/9/03***		
782-M	**Chlorophenols by Acetylation and GC/ECD**				**9/9/03**
795-M	Determination of Chlorobiphenyls				4/23/91
800-M (SCL)	Acid Digestion of Oils for ICP and FAA	pending			
815-M (SCL)	**Gasoline and Gasoline Range Organics (GRO) by GC/FID Purge and Trap Method with Optional BTXE Analysis and PID in series**		**6/10/04***		
816-M (SCL)	**Diesel Range (DRO) and Motor Oil Range (MORO) Organics by GC/FID**		**6/10/04***		

Method#	Title of Method	Status (date completed)			
		Draft	Operational	Validated	Archived
820-M	**Screening for Dithiocarbamate Residues in Soil by Headspace Analysis of Carbon Disulfide**				**5/12/99***
821-M	**GC/NPD Screening Procedures EPTC Screening in Soil**				**5/12/99***
822-M	**Determination of Carbendazim and Thiophanate-Methyl in Soil**				**6/10/98***
841-M	Malathion and Related Products				4/15/98
850-M	Methylisothiocyanate in Vegetation Samples by GC/MS Capillary Column Purge and Trap		pending		
880-M	Polychlorinated Dibenenzo-P-Dioxins and Polychlorinated Dibenzofurans	5/92		pending	
895-M	OCDD and OCDF by Electron Capture "GLC"				9/28/89
938-M	**Determination of Organic Lead Compounds by FAAS**	**6/10/03***			
939-M	**Determination of Organic Lead Compounds by Graphite FAAS**		**4/16/04***		
940-M	Soluble and Total Phosphorus Analysis by ICP				9/9/97
973-M	Determination of Leached Chlorine from Solid Samples				10/9/97
3031-M	Acid Digestion of Organic Materials for ICP-AES and FAAS				9/94

*****Method signed

TABLE 4.1-24

ECL SOPs

SOP #	Title of SOP	Status (date completed)		
		Draft	**Final**	**Archived**
600-S	Ahuraa (First Defender) Raman Spectroscopy	pending		
700-S	**General Glassware Preparation**		**4/12/04***	
701-S	**Initial Sample Preparation for Volatile Organic Analysis**		**3/4/05***	
702-S	**Initial Sample Preparation for Semi-Volatile Organic and Inorganic Samples**		**3/4/05***	
703-S	**Initial Sample Prep. for Samples not Requiring Waste Characterization**		**3/4/05***	
704-S	**Operation and Cleaning of Automated Milling Equipment**		**9/21/05***	
705-S	**Operation of Sample Ejector**		**9/21/05***	
706-S	**Sample Receipt**		**3/22/05***	
707-S	**Sample Handing and Chain-of-Custody**		**7/27/04***	
708-S	**Management of Lab. Generated Hazardous Materials**		**5/14/03***	
709-S	**Sample Storage and Disposal**		**4/29/05***	
710-S	Records Management	pending		
711-S	**Protocol for the Disposal of ECL Samples Analyzed by Commercial Laboratories**		**8/13/01***	
712-S	Emergency Response	pending		
713-S	**Documentation Specifications for Samples Analyzed at ECL-BERK and ECL-SC**		**4/23/03***	
714-S	Data Management of Automated Data System	pending		
715-S	**QC Rules for Organic Analyses (GC and HPLC)**		**3/17/03***	
716-S	QC Rules for Organic Analyses (GC/MS)		pending	

SOP #	Title of SOP	Status (date completed) Draft	Final	Archived
717-S	QC Rules for Inorganic Analysis		pending	
718-S	**Audit of Contract Laboratory Data**		**4/20/04***	
719-S	**ATP Review**		**2/6/03***	
720-S	**Requests for Consultation, Data Validation, Data Review and Laboratory Audits**		**4/21/04***	
721-S	**Procedures for the Distribution of Laboratory Sample Analysis Reports**		**7/10/02***	
722-S	**Procedures for Calculating Control Limits for Accuracy and Precision**		**4/20/04***	
723-S	Confirmation Procedures for Organic Methods			pending
724-S	Confirmation Procedures for Inorganic Methods			pending
725-S	**Analysis of Samples from Clandestine Drug Labs.**		**6/29/99***	
726-S	**Handling Client Feedback and Complaints**		**2/10/03***	
727-S	**Soil and Solid Waste Sampling for VOCs**			**7/18/02***
728-S	**Requesting Out of State Travel**		**10/14/98***	
729-S	**Procedures for the Handling and Extraction of Soil Samples in ENCORE Samplers for VOC Analysis**	**6/10/04***		
730-S	**Determination of % Dry Solids**		**4/19/04***	
731-S	**Toxicity Characteristic Leaching Procedure**		**5/17/04***	
732-S	**Guide for Field Soil Sampling with Encore Sampler for VOCs Analysis**	**6/10/04***		
734-S	**N-Methylcarbamates by HPLC**			**3/20/02***
735-S	Investigation of Laboratories	pending		
736-S	**Acquiring Missing Information on the SAR**	**1/21/03***		

SOP #	Title of SOP	Status (date completed) Draft	Final	Archived
737-S	Laboratory Electronic Analytical Report Management w/ LIMS	pending		
738-S	LIMS: Data backup and Recovery for Empower Chromatography Data System	pending		
739-S	**Modified EPA Method 1664: n-Hexane Extractable Material (HEM) and Silica and Sludges by Extraction and Gravimetry**	**6/10/04***		
740-S	**Determination of the Less than 100 micron Fraction of Solid Samples**		**6/10/04***	
741-S	**Request for Purchase of Equipment and Supplies**		**10/25/99***	
742-S	**Request for Purchase of Supplies with a Blanket Purchase Order**	**9/30/99***		
750-S	LIMS Work Flow of ECL Sample Tracking	pending		
760-S	**Wipe Sampling and Extraction Protocol for Pesticides and PCB's Analysis**			**5/24/04***
765-S	Analysis of Methamphetamine by GC/MS	pending		
780-S	Screening Test Method for Water Reactivity		pending	
785-S	**EDB and DBCP in Soil**			**3/13/02***
792-S	**Total Halogens in Oil**			**3/22/03***
818-S	Total Volatile Petroleum Hydrocarbons by GC/FID Headspace Analysis			9/91
820-S	Purge and Trap Method for Halogenated Volatile Organics			3/24/87
821-S	Halogenated Volatile Organics			3/24/87
830-S	**Analysis of 1,4-Dioxane in Water by Closed-System Purge-and-Trap and Gas Chromatography/Mass Spectrometry with Selected Ion Monitoring**		**6/10/04***	
850-S	GC/MS Headspace Method for Volatile Organics		pending	
855-S	Sample Preparation - Modified Method 5035	pending		
860-S	Total Organic Carbon In Soil and Sediments			5/27/94
870-S	**Procedure for Liquid Waste Handling and Disposal using Glass Bottles**		**7/1/03***	
871-S	Procedure for the Analysis of human Serum for Organochlorine Pesticides			pending
881-S	**Washing Environmental glassware for PCDD and PCDF**		**11/22/04***	

SOP #	Title of SOP	Status (date completed)		
		Draft	Final	Archived
882-S	**Washing Biological glassware for PCDD and PCDF**		**7/10/02***	
883-S	**Lipid Determination of Human Adipose Samples**		**11/22/04***	
884-S	**Extraction of Human Adipose Samples**		**11/22/04***	
885-S	**Procedure for Assembling and Operating a Disposal Carbon Column for the Analysis of PCDD/PCDFs in Environmental Samples**		**7/10/03***	
886-S	**Modified Smith/Stalling Procedure for the Analysis of PCDD/PCDFs and coplanar PCBs in Biological Samples**		**11/22/04***	
887-S	**Use of Fluid Management System's (FMS) Automated Gel Permeation Chromatography (GPC) and Florisil Column in the Clean-up of Adipose Samples for PCB and OCP Analyses**		**11/22/04***	
888-S	**Procedure for the Extraction and clean-up of Milk Samples for PCDD/PCDF, PCB, PBDE and OCP Analysis**	**7/15/01***		
889-S	**Safety Considerations When Using a Torch to Seal Ampules**		**11/22/04***	
890-S	Extraction, Clean-up and Lipid Determination of Fish Samples for PCDD/PCDF, Coplanar PCB, PBDE Analysis	11/22/04*		
891-S	Preparation and Analysis of Blood Serum for PCBs, OCPs, and PBDEs	pending		
892-S	Apparatus and Materials Used in Preparations of Samples for Trace Organohalogens	pending		
894-S	Gas tank Use & Monitoring	pending		
900-S	**Equipment Calibration Procedure for Pipets**		**9/20/05 ***	
901-S	**Equipment Calibration Procedure for Dispensers/Dilutors**		**9/21/05 ***	
902-S	**Glassware Cleaning for Metal Determinations**		**9/20/05 ***	
903-S	**Equipment Calibration Procedure for Balances**		**4/9/04 ***	
904-S	**Guidelines for Choosing the Proper Analytical Method for TPH Analysis**		**6/10/04 ***	
906-S	Digestion of Water and Liquid Samples for Metals Determination			2/10/98
907-S	Preparation of Water Samples for AAS or ICPAES Analysis			2/11/98
908-S	Digestion of Soil, Solid Waste or Sludge for Metal Determinations			6/5/90

SOP #	Title of SOP	Status (date completed)		
		Draft	Final	Archived
909-S	Digestion of Oil and Oily Samples for Metals Determinations			9/9/99
910-S	California Waste Extraction Test		6/10/03*	
911-S	Microwave Assisted Acid Digestion of Oil, and Oily Samples for Metal Determinations			2/24/98
912-S	Fluorescent Lamp Preparation for Metals, Mercury, WET and TCLP Determinations	6/10/03		
913-S	Cathode Ray Tube Preparation for Metals, Mercury, WET and TCLP Determination	6/10/03		
914-S	Preparation of Cold cathode Fluorescent Lamp Preparation for Ha Testing including WET and TOP		1/26/04*	
915-S	Toxicity Characteristic Leaching Procedure for Metals			2/9/98
916-S	Preparation of Consumer Electronic Devices Containing Liquid Crystal Displays (LCDs) for Metals, WET & TCLP		1/26/04*	
920-S	pH Electrometric Measurement			2/11/98
930-S	Determination of Metals by Flame Atomic Absorption Spectrometry			2/10/98
932-S	Determination of Metals by Graphite Furnace Atomic Absorption Spectrometry (GFAAS)			2/10/98
936-S	Determination of Hg by Cold Vapor Technique			2/10/98
940-S	**Dry Cell Battery Preparation for Metals, pH, Alkalinity, Wet and TCLP Determinations**			**4/9/04 ***
955-S	Extraction of Percholorate in Soil, Sludge and Solid Samples	pending		
960-S	Determination of Anions by Ion Chromatography			3/2/98
970-S	Headspace Analysis for Hydrofluoric Acid			12/27/91
980-S	Distillation and Screening for Cyanide			2/11/98
983-S	Determination of Cyanide by Ion-Selective Electrode			3/13/90
984-S	Reactive Cyanide			9/9/99

SOP #	Title of SOP	Status (date completed)		
		Draft	Final	Archived
991-S	Reactive Sulfide			9/9/99
992-S	Titrimetric, Iodine for Sulfide			2/11/98
993-S	Determination of Sulfide by Methylene Blue Method			2/11/98

4.2 MOBILE LABORATORY

The DTSC mobile laboratory (ML) funded by the Governor's Office of Homeland Security Grant Program was received in April of 2005. The primary objective is to respond and detect chemical releases following a natural disaster, industrial spill, or act g chemical terrorism. The secondary objectives are to support departmental projects such as site investigations, remediation and enforcement. The ML is an extension of ECL's analytical capabilities to the field to expedite clean up activities for the protection of public health and the environment.

The ML includes two separate self- contained compartments, one for sample preparations and one for sample analyses. The ML is well equipped with safety features to protect the instrument operators and the environment. The sample preparation compartment includes high efficiency particulate air filtration (HEPA) systems, a glovebox with bio-decontamination system for operator's protection, a fume hood and other common safety features. The analytical compartment is equipped with state-of-the-art measurement systems.

4.2.1 Gas chromatograph/mass spectrometers (GC/MS)

Two on-board gas chromatograph/mass spectrometers (GC/MS) are specially configured for the identification and confirmation of unknown chemicals in air, solid, and liquid samples. These include:

Agilent 6890 GC/5973 MSD with dual-wavelength Flame Photometric Detectors (FPD) is designed for detecting chemical agents, specifically compounds containing sulfur and phosphorus. A Dynatherm Model IACEM 980 Thermal Desorber is attached to the unit for air analysis. Two different GC columns are installed in this unit, one for detecting volatile organic compounds (VOC) and one for detecting toxic chemical agents. Automatic Mass Spectral Deconvolution and Identification Software (AMDIS) and retention time locking procedures are included in the operating system for automatic identification of a list of target chemical agents without depending on the presence of chemical standards.

Agilent 6850 GC/ 5973 MSD with an auto-sampler is designed for detecting toxic industrial chemicals. A ChemStation with a RTL pesticide MS Library enhances the identification and confirmation of pesticides.

4.2.2 Field portable analytical instruments

A number of field portable analytical instruments are acquired for fast on-site analysis. These include:

INFICON HAPSITE Three units of field-portable GC/MS for the detection and confirmation of VOCs in air, water, and soil. The unit can be taken to the "hot zone" by a specifically trained first respondent for on site sampling and analyses. Alternatively, they can be used to identify volatile chemicals.

X- Ray Fluorescence Analyzer (XRF) A hand-held XRF analyzer (Oxford X-Met 300TX) for screening elements in solids and liquids.

Fourier Transform Infrared Reflectometer (FTIR) A Smith Detector Travel IR HCI - HazMat Chemical Identification for organic analysis of solids and liquids

DU-Spectrometer A Beckman spectrometer for analyzing cyanide and chromium (+6) in samples

Raman Spectrometer a handheld Ahura First Defender that has the capability to directly analyze organic compounds in solids and liquids inside a container, without exposing the chemist to hazardous substances

pH Meter for waste classifications

Radiation Detectors Three units of hand – survey radioactive monitors for checking alpha, beta and gamma rays in the sample

HazMat Test Kits for quick identifications of hazardous substances to guide the laboratory analysis

Cameo/Aloha Meteorological Station A wireless weather station to monitor weather conditions for wind direction, wind speed, temperature, humility, etc., to facilitate the selection of sampling locations and for plume modeling.

Satellite System A satellite system is installed in the ML for communication and data transmission to ECL and other state and federal fixed laboratories for data sharing and decision making during an emergency response.

Method development for analyzing chemicals of concern is in progress. When the ML analytical capabilities are established and the standard operating procedures are available, the procedures for requesting the deployment of ML and field instruments will be posted in the DTSC internet: http://www.dtsc.ca.gov/AssessingRisk/HML/Mobile_Lab.cfm

Contacts

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4.3 ENVIRONMENTAL CHEMISTRY LABORATORY - SOUTHERN CALIFORNIA.

4.3.1 Introduction.

The Environmental Chemistry Laboratory - Southern California (ECL-SC) is a branch of ECL and has analytical capabilities similar to ECL. The laboratory also provides method development and technical consultation services. ECL-SC has recently developed an improved method for the wet ashing of soil and sludge samples for metal analysis and methods development in the analysis for gasoline in soils. ECL-SC also supports the Pollution Prevention Program in the evaluation of new processes for the treatment and recycling of hazardous waste by recommending and providing the appropriate analytical services.

4.3.2 Analytical Requests.

See Section 4.1.2.

4.4 DHS ENVIRONMENTAL HEALTH LABORATORY (EHL) (FORMERLY THE AIR AND INDUSTRIAL HYGIENE LABORATORY).

4.4.1 Introduction.

EHL provides analytical services and leadership in the development of laboratory methods, and carries out research programs to assist State, Federal, and County agencies in the identification, evaluation, and control of public health hazards associated with airborne toxic materials. On matters pertaining to hazardous waste EHL's air vector component works very closely with the Environmental Chemistry Laboratory (ECL) especially in the area of air sampling and analysis. The work involves five interrelated functional tasks as follows:

1) Analytical Services - EHL provides analyses of air samples collected by Department of Toxic Substances Control (DTSC) and other related agencies, primarily for QC/QA purposes, and where analytical resources are unavailable on a routine basis.
2) Field Studies - EHL participates in various site characterization investigations involving air monitoring of landfill and active dump sites. EHL staff serves as technical observers and monitors in remedial and feasibility studies.

3) Training - Because of its expertise in air sampling and analysis, EHL periodically provides training to DTSC staff on basic aerometric techniques and related analytical procedures.

4) Method Development - EHL evaluates, develops, and designs effective air sampling and analytical methods crucial for the generation of high quality data for enforcement and compliance purposes. Also, staff actively participates in interlaboratory studies.

5) Consultation - EHL provides aerometric information and guidelines to DTSC personnel on matters associated with site characterization projects; critiques proposed work plan protocols and evaluates results of completed projects; participates in interagency meetings involving air monitoring strategies and recommends quality control and quality assurance measures.

4.4.2. Environmental Health Laboratory Services.

Sample Analysis:

1) ECL may allocate special analyses to EHL, or by prior arrangement DTSC units submit samples directly to EHL.

2) ECL request form, (DHS 8002) is to accompany the samples with the following further specifications: "**for EHL**".

a) Under g. field information list the total air volume collected for all air

samples.

b) Use separate forms for each type of sample i.e., air, material, or biological.

c) In listing the samples group together (or use a separate form) those requiring the same analysis, or set of analyses along with their blanks.

d) Requester's phone number, preferably ATSS, is helpful should questions arise about the request. Include a mailing address as well as the person to whom the report should be sent.

3) Should a hi-vol filter sample be submitted, use the 24-Hour Data Air Sample Report Form (TSD-2). County, site, and project codes (upper right) do not apply. Instrument number and date of last calibration are required to relate the flow meter reading to true air flow. For sampling times, the exact start and finish times should be entered and reconciled with the elapsed time meter readings, if available. The lower part of the form, pollutant description, codes and analysis are for lab use only. Only the original copy is required by the lab, and the other copies are available for the requester. Examples are available from EHL.

Sampling Consultation:

EHL has considerable expertise in air sampling and analysis. Sampling and analytical procedures are essentially interdependent functions and hence, personnel involved in aerometric field studies should consult with EHL prior to conducting the investigation. This requirement assures that air samples collected in the field are compatible with established analytical methods.

4.5 CONTRACT LABORATORIES.

The Department contracts with commercial laboratories for chemical laboratory services to supplement the services provided by ECL and ECL-SC. This contract is in addition to the contract laboratories used for the Bond Act implementation. Methods, turnaround times, and quality assurance requirements for water and solid wastes are listed in tables 4.4-1 and 4.4-2, respectively. The contract lab service is managed by ECL. When ECL is at full capacity, the excess samples will be sent to the contract lab, as directed by ECL. Sample collectors must not send samples to the contract lab without prior authorization from the ECL Sample Management Officer (SMO). Analytical and Quality Control Reports from the contract labs are sent directly to the sample collectors. A copy of all Analytical and Quality Control Reports, along with complete data packages, are sent to the contract manager at ECL. The contract manager uses this information to both ensure contract compliance and track workload status at the contract labs. The Quality Assurance and Data Validation group works closely with the contract manager to ensure that the work performed is in compliance with contract specifications. In addition, data validation can be performed on special requests for select data packages. Questions regarding data validation should be referred to Cindy Dingman at (510) 540-2329 or Lorna Garcia at (510) 540-2441.

Table 4.4-1 Water Analysis Methods and Quality Assurance Requirements.

CATEGORY	METHOD #	REFERENCE	DETECTION LIMIT (ug/L)	ACCURACY %	PRECISION[a] %	QA/QC PROTOCOL
Sb,As,Be,Ba, Cd,Cr,Co,Cu Pb,Mo,Ni,Se, Ag,Tl,V,Zn	200 Series	a	10-100[c]	80 - 120	20	A,B,C,D,E
Mercury	245	a	0.5	80 - 120	20	A,B,C,D,E
Chromium (VI)	218.5	a	50	85 - 115	10	A,B,C,D,E
Sulfide	376	a	100	85 - 115	10	A,B,C,D,E
Cyanide	335	a	40	85 - 115	10	A,B,C,D,E
Fluoride	340/300[b]	a	100	85 - 115	15	A,B,C,D,E
Chloride	325/300[b]	a	3000	85 - 115	15	A,B,C,D,E
Nitrite	354/300[b]	a	300	85 - 115	15	A,B,C,D,E
Nitrate	352/300[b]	a	300	85 - 115	15	A,B,C,D,E
Sulfate	375/300[b]	a	5000	85 - 115	15	A,B,C,D,E
Purgeable Halocarbon	601	b	0.02-2.0[c]	70 - 110[c]	25	A,B,C,D,E
Purgeable Aromatics	602	b	0.2-4.0[c]	40 - 110[c]	25	A,B,C,D,E
Phenols	604	b	0.2-20[c]	40 - 110[c]	20	A,B,C,D,E
Organochlorine Pesticides and PCBs	608	b	0.02-1.0	85 - 115	10	A,B,C,D,E
PAHs	610	b	0.02-2.5[c]	80 - 120[c]	15	A,B,C,D,E
Organophosphorus Pesticides	614/622	c	0.02-5.0[c]	50 - 120[c]	20	A,B,C,D,E
Chlorophenoxy Herbicides	509B	d	10	60 - 110[c]	15	A,B,C,D,E
Purgeables	624	b	5.0-10[c]	60 - 145[c]	25	A,B,C,D,E
CATEGORY	METHOD #	REFERENCE				

			DETECTION LIMIT (ug/L)	ACCURACY %	PRECISION[a] %	QA/QC PROTOCOL
Base/Neutral & Acids	625	b	10-50[c]	10 - 130[c]	50	A,B,C,D,E
Carbamates	632	c	0.01-0.5[c]	40 - 110[c]	15	A,B,C,D,E
pH	150	a				A,C
Fish Bioassay	Section 66696 (a)(4)	e				A,F,G

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[a] Maximum relative percent difference (RPD) of duplicates at ten or more times the limit of detection.

[b] The Determination of Inorganic Anions in Water by Ion Chromatography - Method 300.0, Test Method, EPA-600/4-84-017, March 1984.

[c] Check methods for values of specific species.

a Methods for Chemical Analysis of Water & Wastes, EPA 600/4-79-020

b "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act", 40 CFR Part 136, EPA, October 26, 1984.

c Nonconventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079-C.

d Standard Methods for the Examination of Water and Wastewater, 16th Edition, 1985.

e California Administrative Code, Title 22, Chapter 30, Article 11, "Criteria for Identification of Hazardous and Extremely Hazardous Wastes".

QA/QC PROTOCOLS:

A All QA/QC procedures required by the method.

B One method blank for every ten samples or batch of samples or type of matrix, whichever is more frequent.

C One sample analyzed in duplicate for every ten samples or batch of samples or type of matrix, whichever is more frequent.

D One spiked sample for every ten samples or batch of samples or type of matrix whichever is more frequent. Spike shall be made at ten times the detection limit or at the analyte level.

E Analyze quality control sample (if available) with every ten samples or batch of samples or type of matrix, whichever is more frequent.

F One control for each sample.

G Bioassay screening at 250 mg/L and 750 mg/L, at a minimum.

Table 4.4-2 Soil, Liquid Waste, and Solid Waste Analysis Methods, and Quality Assurance Requirements.

CATEGORY	METHOD #	REFERENCE	DETECTION LIMIT mg/Kg	ACCURACY %	PRECISION[a] %	QA/QC PROTOCOL
Sb,As,Be,Ba, Cd,Cr,Co,Cu Pb,Mo,Ni,Se, Ag,Tl,V,Zn	Section 66700	a	1.0	75 - 125	35	A,B,C,D,E
Mercury (Hg)	7471B	a	1.0	75 - 125	35	A,B,C,D,E
Chromium (VI)	7195/6A/7	a	0.5	80 - 120	35	A,B,C,D,E
Sulfide	9030B	a	10	80 - 120	15	A,B,C,D,E
Cyanide	9010B	a	5	80 - 120	15	A,B,C,D,E
Fluoride	340/300	b,c	10	80 - 120	20	A,B,C,D,E
Chloride	325/300	b,c	100	80 - 120	20	A,B,C,D,E
Nitrite	354/300	b,c	10	80 - 120	20	A,B,C,D,E
Nitrate	352/300	b,c	10	80 - 120	20	A,B,C,D,E
Sulfate	375/300	b,c	100	80 - 120	20	A,B,C,D,E
Waste Extraction Test (WET)[c]	Section 66700	d	0.1 mg/L	75 - 125	35	A,B,C
Halogenated Volatile Organics	8010B	a	0.2-20[d]	30 - 110[d]	50	A,B,C,D,E
Aromatic Volatile Organics	8021B	a	2.0-40[d]	30 - 110[d]	50	A,B,C,D,E
Phenols	8041	a	0.2-20[d]	30 - 140[d]	40	A,B,C,D,E
Organochlorine Pesticides	8081A	a	0.5-10[d]	25 - 140	25	A,B,C,D,E
PCBs	8082	a	0.5-10[d]	25 - 140	25	A,B,C,D,E
PAHs	8100/8310	a	0.2-20[d]	50 - 120[d]	25	A,B,C,D,E
Organophosphorus Pesticides	8141A	a	1.0-20[d]	50 - 120[d]	25	A,B,C,D,E

CATEGORY	METHOD #	REFERENCE	DETECTION	ACCURACY	PRECISION[a]	QA/QC

			LIMIT mg/Kg	%	%	PROTOCOL
Chlorophenoxy Herbicides	8151A	a	1	50 - 110[d]	20	A,B,C,D,E
GC/MS Method: Volatile Organics	8260B	a	1	60 - 140[d]	20	A,B,C,D,E
GC/MS Method: Semi-Volatile Organics	8270C	a	1-5[d]	30 - 140[d]	20	A,B,C,D,E
pH	9040B	a				A
Fish Bioassay	Section 66696 (a)(4)	d				A,F,G
Ignitability	1010/1020	a				A
Corrosivity[e]	Section 66708	d				A
Reactivity[d]	Section 66705	d				A

[a] Maximum relative percent difference (RPD) of duplicates, at ten or more times the limit of detection.

[b] Method may be modified to use specific ion electrode or colorimetry.

[c] Extraction and analysis of antimony, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, zinc, and mercury.

[d] Check methods for values of specific species.

[e] Test by corrosivity toward steel.

[f] Water reactivity and cyanide and sulfide screening.

a Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW- 846, 2nd Edition, U. S. EPA, revised April 1984, or 3rd Edition, 1986.

b Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.

c The Determination of Inorganic Anions in Water by Ion Chromatography - Method 300.0, Test Method, EPA-600/4-84-017, March 1984. Sample preparation such as aqueous extractions may be needed.

d California Administrative Code, Title 22, Chapter 30, Article 11, "Criteria for Identification of Hazardous and Extremely Hazardous Wastes".

QA/QC PROTOCOLS:

A All QA/QC procedures required by the methods.

B One method blank for every ten samples or batch of samples or type of matrix, whichever is more frequent.

C One sample analyzed in duplicate for every ten samples or batch of samples or type of matrix, whichever is more frequent.

D One spiked sample for every ten samples or batch of samples or type of matrix, whichever is more frequent. Spikes shall be made at ten times the detection limit or at the analyte level.

E Analyze EPA quality control sample (if available) and/or NBS traceable standards (if available) with every ten samples or batch of samples or type of matrix, whichever is more frequent.

F One control for each sample.

G Bioassay screening at 250 mg/L and 750 mg/L, at a minimum.

4.6 LABORATORY ACCREDITATION.

The California Hazardous Waste Laboratory Certification Program was created in 1982 (AB 3449, Chapter 1209, Statutes of 1982). The bill directed the Department to adopt regulations governing the criteria for certification, the certification process, and the procedures to be used by hazardous waste laboratories to analyze and identify waste samples. The certification regulations were adopted on April 12, 1985. Effective April 11, 1986, any analysis of hazardous waste required by the Hazardous Waste Control Law must be performed by certified laboratories. Minimum requirements were established for:

Test procedures
Quality assurance programs
Laboratory equipment
Personnel qualifications

Mechanisms were prescribed to monitor the operation and performance of a laboratory through site inspections and proficiency testing.

During 1988, Assembly Bill 3739 (Jones) was signed into law. The law was amended by AB 2160 (Bronzan) in 1989 and AB 45 (Jones) in 1990. This law consolidated the Hazardous Waste Testing Laboratory Certification program with an existing Water Testing Laboratory Certification program, a pesticide testing in food program and a new wastewater testing accreditation program. Certification regulations have been adopted by the DHS Environmental Laboratory Accreditation Program (ELAP) to certify/accredit environmental testing laboratories. SB 1304 (Committee on Environmental Quality, Senator Sher, Chair), 1999; and SB 2203 (Committee on Environmental Quality, Senator Sher, Chair), 2000 authorized ELAP to participate in a national environmental laboratory accreditation program according to the standards adopted by the National Environmental Laboratory Accreditation Conference (NELAC). This national program is administered by the Director of the National Environmental Laboratory Accreditation Program (NELAP). California is a recognized Accrediting Authority to grant NELAP accreditation to an applicant

laboratory. Thus, an environmental laboratory needs to be either certified under ELAP or accredited under NELAP in order to perform environmental testing for regulatory purposes

Questions regarding lab accreditation should be directed to ELAP at (510) 540-2800.

Internet address:

ELAP http://www.dhs.ca.gov/ps/ls/ELAP/default.htm

NELAC http:/www.epa.gov/ordntrnt/ORD/nelac/index.html